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TASK REPORT TO THE ENVIRONMENTAL PROTECTION AGENCY CONTRACT NO. 68-01-6056

CHLORINATED SOLVENT CONTAMINATION
of the
GROUNDWATER
East Central Woburn, Massachusetts

December 8, 1981
TDD No. F1-8110-01

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Field Investigation Team (FIT)
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TDD # F1-8110-01

Chlorinated Solvent Contamination
of the
Groundwater
East Central Woburn, Massachusetts

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SECTION 1 - INTRODUCTION

In May 1979, several chlorinated solvents were detected by the Massachusetts Department of Environmental Quality Engineering (DEQE) in two of the City of Woburn's municipal drinking water wells. As a result, these wells ("G" and "H") were shut down forcing Woburn to use MDC water to supplement its other groundwater wells located near Horn Pond. The levels of contamination detected prior to shutdown and immediately after shutdown are given in Table 1-1.

Table 1-1
Analyses of Water from Wells
"G" AND "H", Woburn, Massachusetts (ppb)

	<u>"G" Well</u>					
	<u>5/21/79</u>	<u>7/24/79</u>	<u>7/24/79</u>	<u>9/25/79</u>	<u>9/28/79</u>	<u>2/26/81</u>
	(1)	(2)	(2)	(3)	(3)	(4)
		(Dupl)				
1,1,1-trichloroethane	1	28	28	ND	10	ND
1,2-trans-dichloroethylene	ND	0	0	ND	11	14
tetrachloroethylene	21	18	13	13	43	36
trichloroethylene	267	208	236	184	400	210
chloroform	12	ND	ND	ND	ND	ND
trichlorotrifluoroethane	ND	22	23	ND	ND	ND

	<u>"H" Well</u>			
	<u>5/21/79</u>	<u>7/24/79</u>	<u>9/26/79</u>	<u>2/26/81</u>
	(1)	(2)	(3)	(4)
1,1,1-trichloroethane	ND	ND	2	ND
1,2-trans-dichloroethylene	ND	ND	ND	14
tetrachloroethylene	18	26	9	41
trichloroethylene	118	188	63	73
chloroform	1	ND	ND	ND
trichlorotrifluoroethane	ND	23	ND	ND

1. Introduction - continued

As a result of the detected contamination, the Ecology and Environment, Inc., Region I Field Investigation Team (E & E FIT) was tasked to perform preliminary assessments and site investigations of fourteen potential sources in East and North Woburn (5, 6, 7). These studies indicated that a number of contaminants were being disposed of into the City of Woburn sewer system by several industries. However, no direct sources of the well contamination were discovered.

E & E was then tasked to perform a comprehensive hydrogeologic investigation and groundwater quality evaluation of a ten square mile portion of East and North Woburn (8, 9). From this study, the known areal extent of contamination for the compounds present in wells "G" and "H" was determined (Figures 1-1 to 1-6).

To supplement existing data, twenty-two additional monitoring wells were installed, seven of which are located near and upgradient of the known contamination plumes affecting wells "G" and "H". The results of groundwater analyses for these seven wells and other appropriately situated accessible wells plus bedrock studies of the area are the subject of this report.

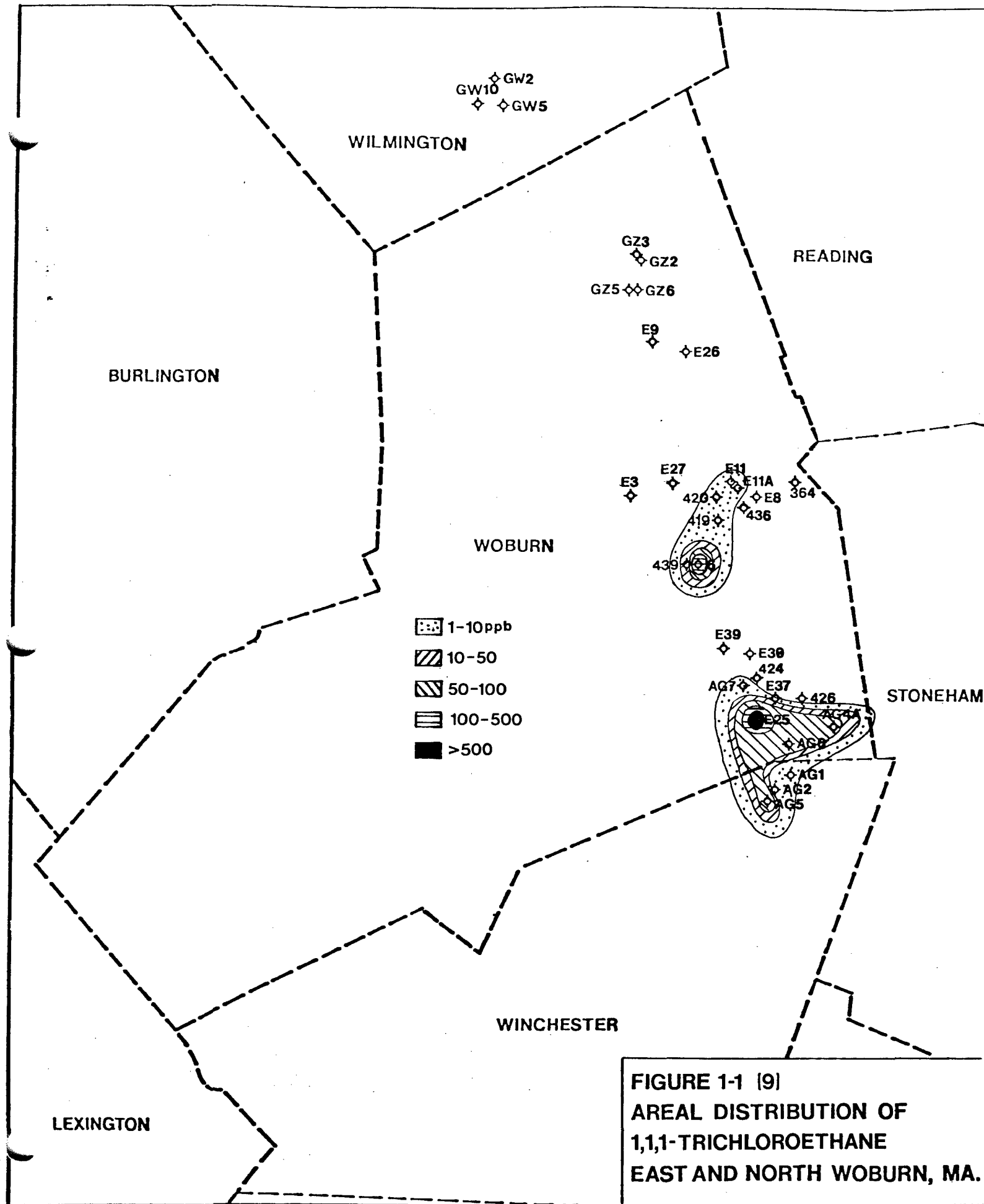


FIGURE 1-1 [9]
AREAL DISTRIBUTION OF
1,1,1-TRICHLOROETHANE
EAST AND NORTH WOBURN, MA.

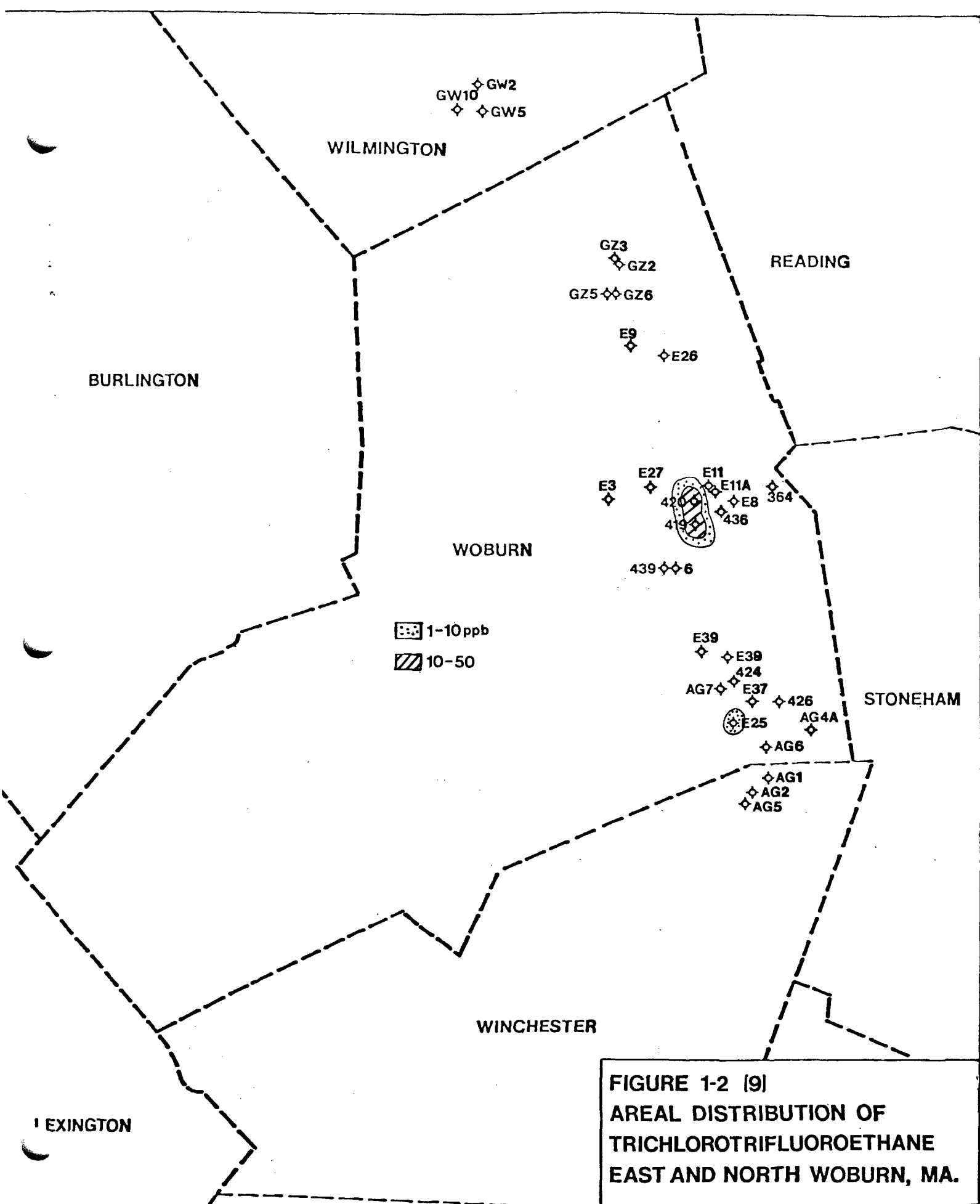


FIGURE 1-2 [9]
AREAL DISTRIBUTION OF
TRICHLOROTRIFLUOROETHANE
EAST AND NORTH WOBURN, MA.

BURLINGTON

WILMINGTON

READING

WOBURN

STONEHAM

WINCHESTER

LEXINGTON

GW10 GW2
GW5

GZ3
GZ2

GZ5 GZ6

E9
E26

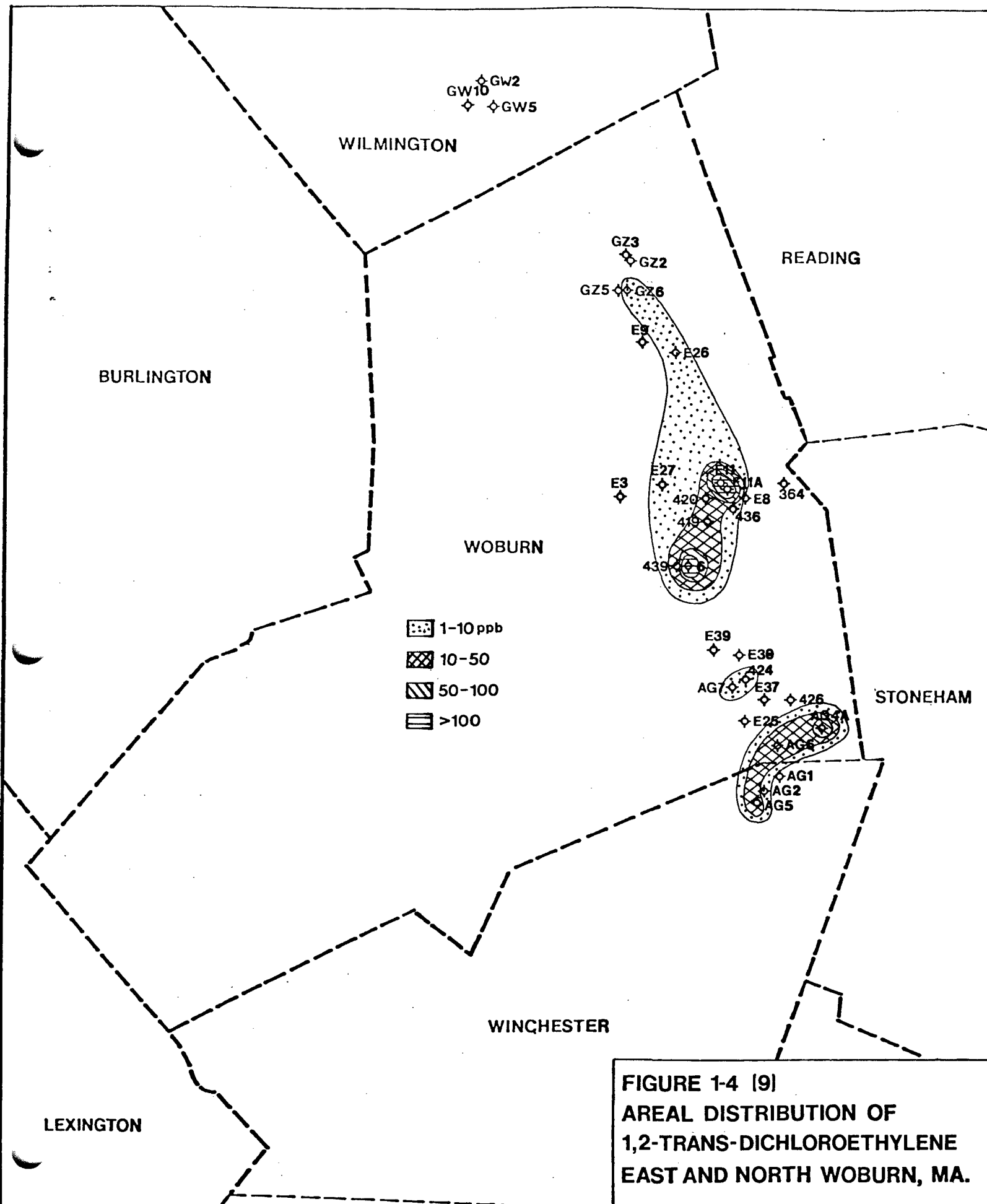
E27 E11
E11A E8
420 436
419 439

364

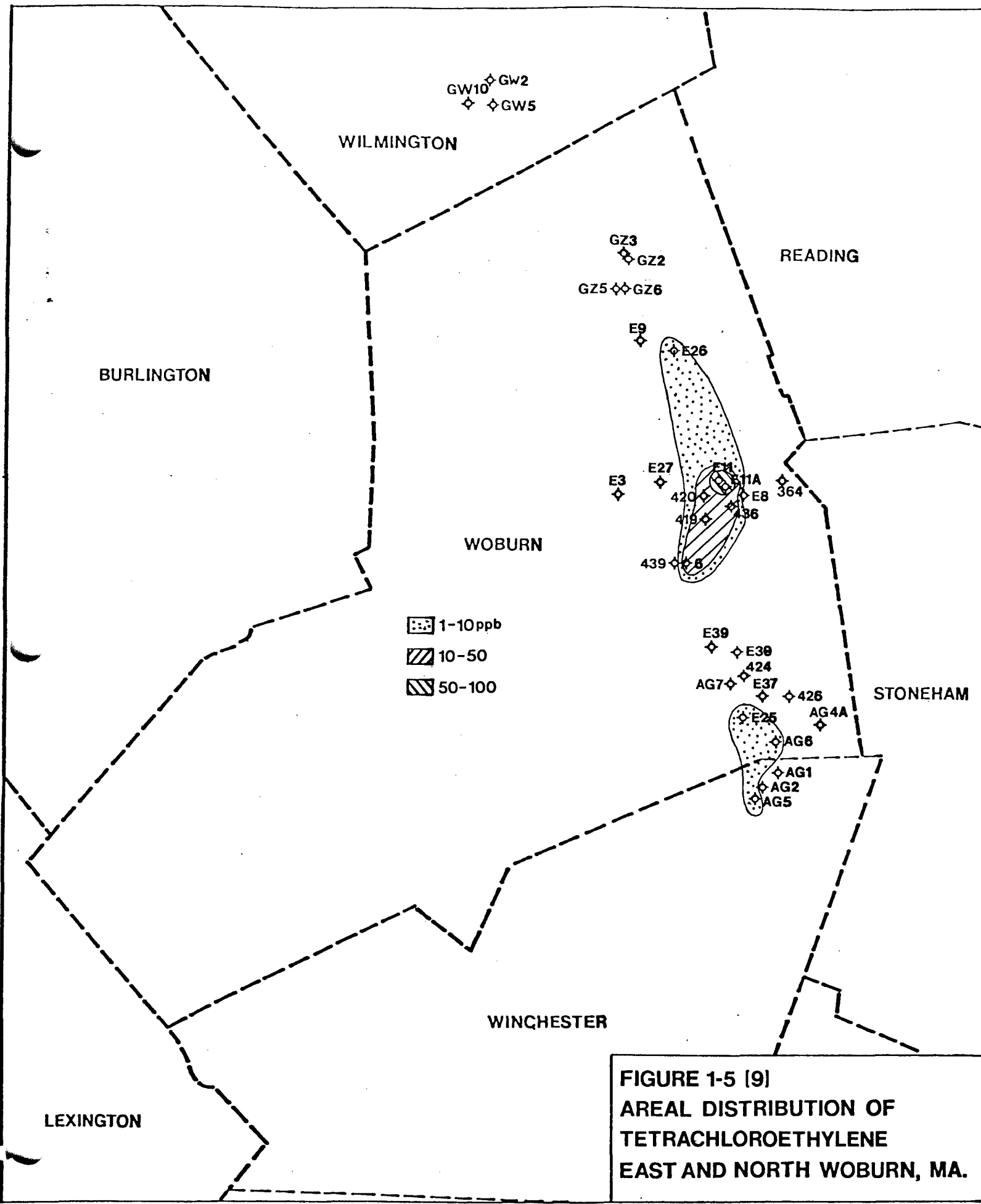
1-10ppb
10-20

E39
E39
424
AG7 E37
426
AG4A
E25
AG6
AG1
AG2
AG5

FIGURE 1-3 [9]
AREAL DISTRIBUTION OF
CHLOROFORM
EAST AND NORTH WOBURN, MA.



**FIGURE 1-4 [9]
AREAL DISTRIBUTION OF
1,2-TRANS-DICHLOROETHYLENE
EAST AND NORTH WOBURN, MA.**



**FIGURE 1-5 [9]
AREAL DISTRIBUTION OF
TETRACHLOROETHYLENE
EAST AND NORTH WOBURN, MA.**

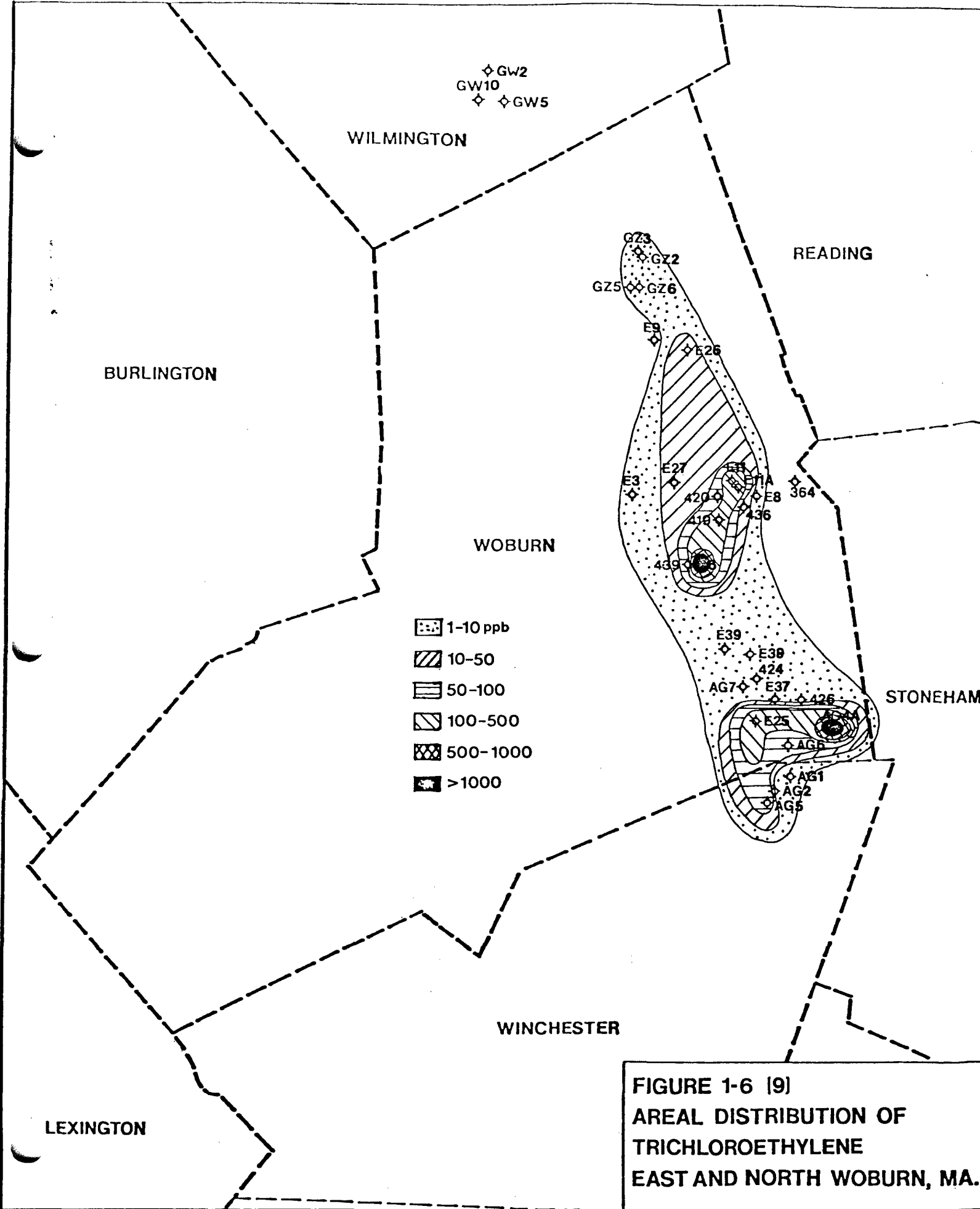


FIGURE 1-6 [9]
AREAL DISTRIBUTION OF
TRICHLOROETHYLENE
EAST AND NORTH WOBURN, MA.

SECTION 2 - DESCRIPTION OF THE STUDY AREA

2.1 INTRODUCTION

Figures 2-1 and 2-2 show the one square mile area covered by this study. The base map (Figure 2-2) was constructed from aerial photographs taken on 7 May 1979. A description of the portions of Woburn located north and south of the study area can be found in References 8 and 10.

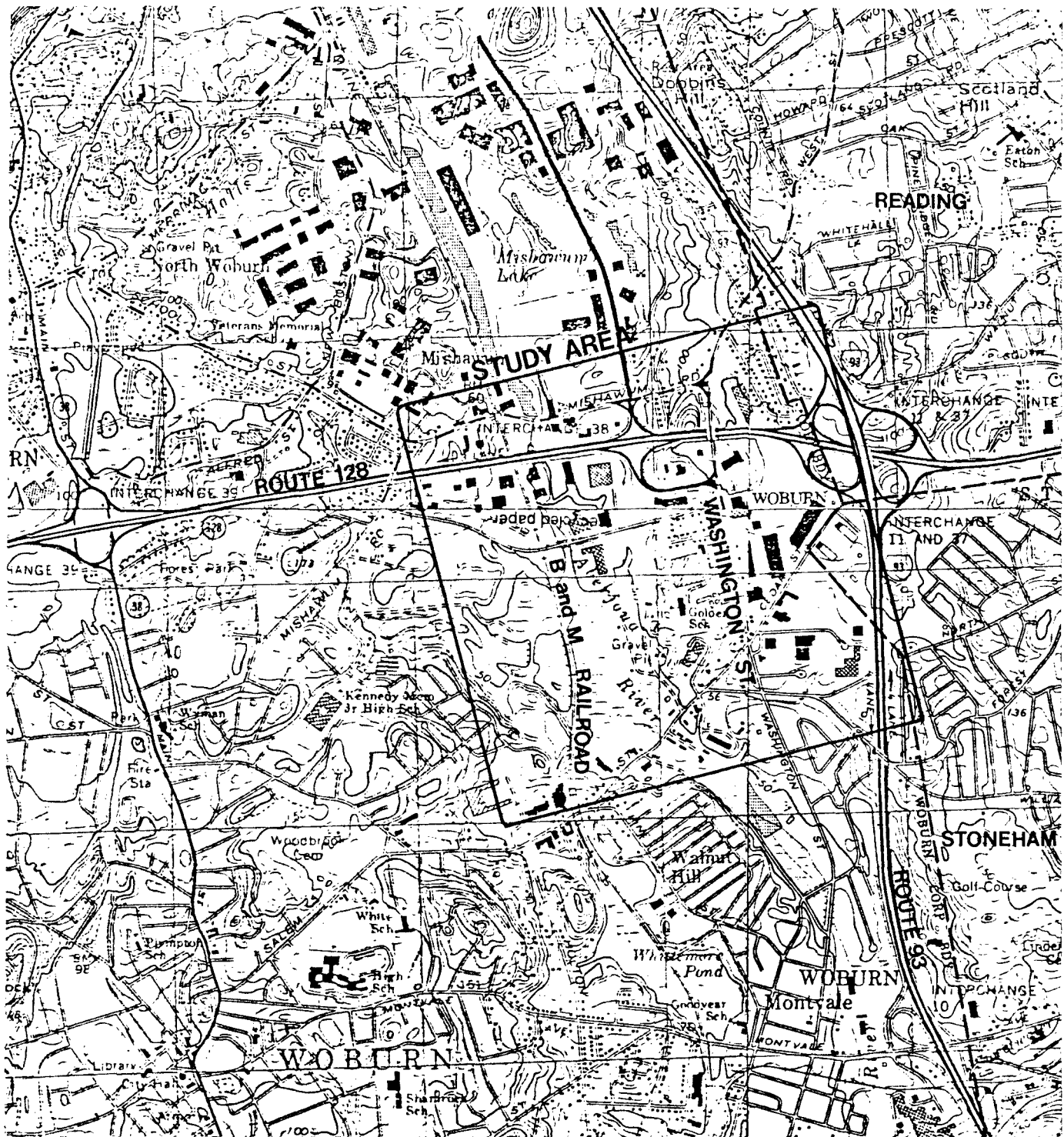
A number of commercial and industrial operations are located within the study area. Those which are located near to and upgradient of the plumes affecting wells "G" and "H" are labelled on Figure 2-2 and identified in the key to that figure. Several of the existing operations very likely use one or more of the chlorinated solvents present in wells "G" and "H".

2.2 WELL AND BOREHOLE LOCATIONS

Thirty-five wells and boreholes have been identified within the study area and are identified on Figure 2-2. Table 2-1 gives the relevant parameters for these wells. Logs for the newly installed EPA and MDC wells are given in Appendix A. Logs for all other wells may be found in Reference 8. E 43 is the location of a spring issuing from a bedrock outcrop adjacent to Route 128.

2.3 SURFACE DRAINAGE

Surface drainage in the study area flows from north to south and consists of the Aberjona River with a few minor tributaries. There is a significant wetlands area associated with the Aberjona in the southwest quadrant of the area. See Figure 2-2 for a map of surface drainage.



**FIGURE 2-1: LOCUS MAP
EAST CENTRAL WOBURN STUDY AREA (11)**

SCALE 1:25000



KEY

- A. AVA - Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall - Commercial
- E. Arlwood, Inc. - Wood/Metal doors, hardware
- F. Brodie, Inc. - Industrial trucks, tractors
- G. Brodie, inc. - Industrial trucks, tractors
- H. Post Office
- I. Bradlee's - Commercial
- J. Celotex Corporation - Warehouse
- K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
- L. ADAP/Kamco. - Commercial, auto parts
- M. Waterbed Warehouse - Commercial
- N. Charrette - Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company - Tire distributor
- Q. Bliss marine - Boating equipment
- R. Hurlbert Datsun - Automobile sales and repair
- s. Cummings Industrial Centers - Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products - Hospital equipment
- V. Cummings Industrial Centers - Offices
- W. Cummings Industrial Centers - Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace - Food wrapping equipment
- AA. Hemingway Transportation, Inc. - General commodities trucking
- BB. Cummings Industrial Centers - Offices
- CC. Cummings Industrial Centers - Offices
- DD. Cummings Industrial Centers - Offices
- EE. Cummings Industrial Centers - Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics - Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

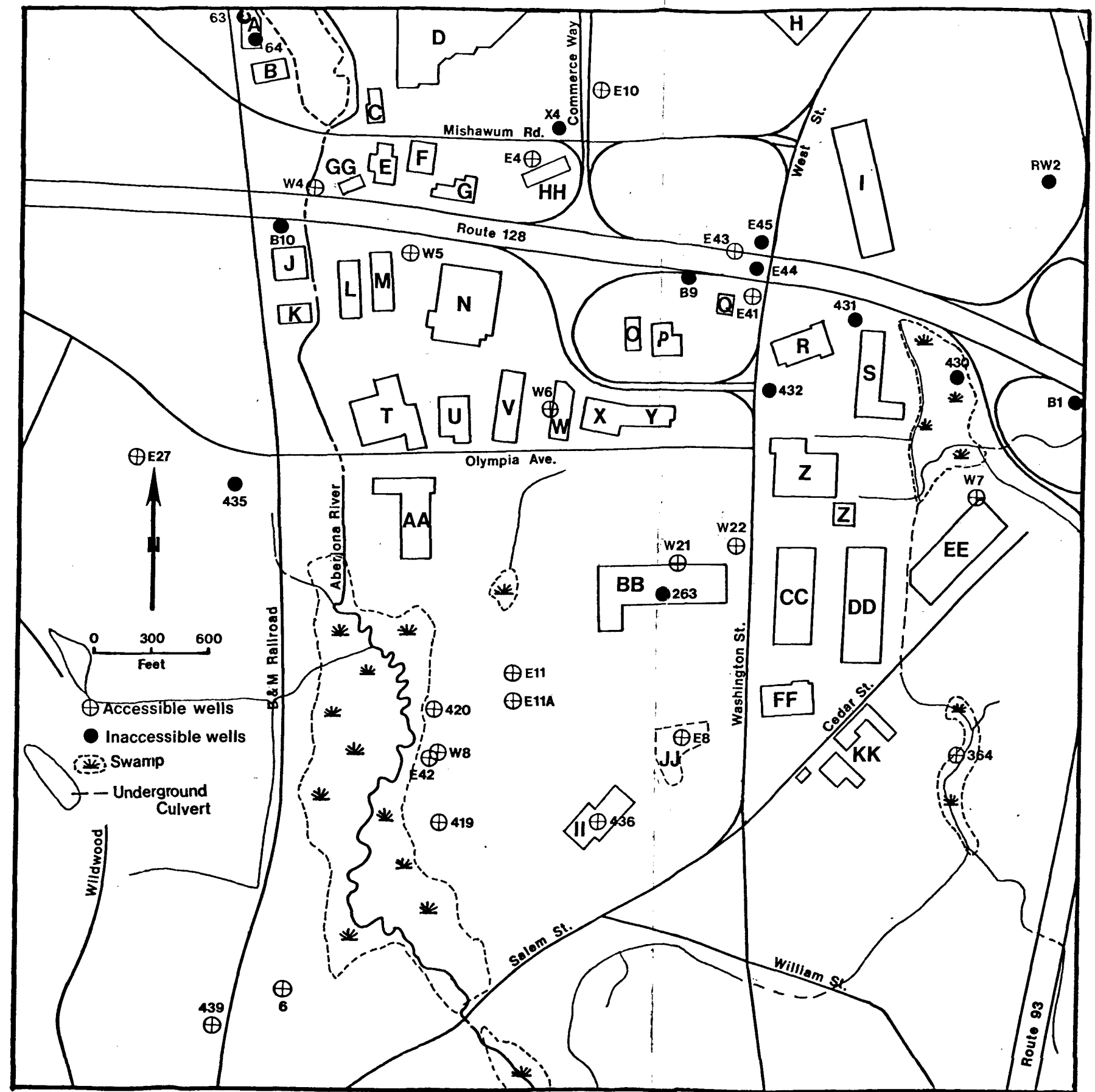


FIGURE 2-2: BASE MAP FOR THE EAST CENTRAL WOBURN STUDY AREA

TABLE 2-1

Parameters for Wells and Boreholes
in East Central Woburn, Massachusetts (8, 12)

Well #	Installed for	Year Installed	Diameter (in.)	Well		Depth to Bedrock(ft)	Level (ft.)	Water		Accessible for Sampling
				Depth (ft)	Use			Date Measured	Use	
6	J. J. Riley	1958	24	51	W	—	5	/58	N	X
63	Stauffer Chem.	1936	18	83	U	—	6	—	N	—
64	Stauffer Chem	1937	24	78	W	—	6	—	N	—
263	Johnson Bros.	1958	8	364	W	60	—	—	I	—
364	Independent Tallow	1940	24	24	W	—	8	—	N	X
419"G"	Woburn	1967	24	88	W	—	1	—	P	X
420"H"	Woburn	1964	24	84	W	—	1	—	P	X
430	Salada Tea Co.	1958	2	15	T	—	0	12/38	U	—
431	Salada Tea Co.	1958	2	5	T	—	3	—	U	—
432	Salada Tea Co.	1958	2	7	T	—	0	—	U	—
435	Lamont	1969	2	86	T	—	6	5/69	U	—
436	N.E. Plastics	1962	Unk	358	W	38	15	2/62	N	X
439	J. J. Riley	1945	Unk	35	W	—	5	—	N	X
E 4	Koala Inn	1980	6	600	U	—	8	10/81	U	X
E 8	Mirra Const.	Unk	Unk	Unk	W	—	—	—	N	X
E10	Woburn Nat'l Bk.	Unk	2	15	W	—	—	—	U	X
E11	Mass Rifle	Unk	Unk	Unk	W	—	—	—	R	X
E11A	Crowley	Unk	Unk	Unk	W	—	—	—	R	X
E27	Rohtstein	Unk	Unk	Unk	W	—	—	—	N	X
E41	MDC	1981	2	54	M	24	26	10/81	U	X
E42	Woburn	Unk	2	27	T	—	2	10/81	U	X
E44	MDC	1981	—	36	B	8	10	8/81	—	—
E45	MDC	1981	—	54	B	14	23	8/81	—	—
B 1	MDPW	1955	—	37	B	—	14	6/55	—	—
B 9	MDPW	1949	—	10	B	—	—	—	—	—
B10	MDPW	1949	—	96	B	—	—	—	—	—
X 4	Woburn	Unk	Unk	21	T	—	—	—	U	—
RW2	E. A. Porter	1932	36	9	U	—	—	—	U	—
W 4	EPA	1981	2	91	M	84	5	10/81	U	X
W 5	EPA	1981	2	66	M	56	3	10/81	U	X
W 6	EPA	1981	2	96	M	86	8	10/81	U	X
W 7	EPA	1981	2	28	M	18	4	10/81	U	X
W 8	EPA	1981	2	128	M	118	2	10/81	U	X
W21	EPA	1981	2	31	M	21	19	10/81	U	X
W22	EPA	1981	2	44	M	36	26	10/81	U	X

W = Water withdrawal
T = Test
M = Monitoring

B = Borehole
U = Unused
N = Industrial
(-) = Unavailable or Not applicable

I = Irrigation
P = Public supply
R = Domestic

2.4 SURFACE TOPOGRAPHY

Figure 2-3 is a map of the surface topography of the study area. The primary sources of data for this map were the United States Geological Survey Topographic Maps for the Lexington, Boston North, Wilmington and Reading, Massachusetts Quadrangles. Some modifications were made as a result of field investigations performed by E & E during the course of this study. All gravel pits present in the 8 May 1979 aerial photographs have been added to this map.

The western portion of the study area is topographically low because it is occupied by the Aberjona River and its associated flood plain. The surface elevations rise rapidly on both sides of the river valley. The surface configuration reflects the underlying bedrock surface. A fault trending N-S is present under the Aberjona River Valley which very likely was controlled by this fault. Many bedrock outcrops are present in the highlands to the east of the river valley.

2.5 WATER TABLE CONFIGURATION AND GROUNDWATER FLOW DIRECTIONS

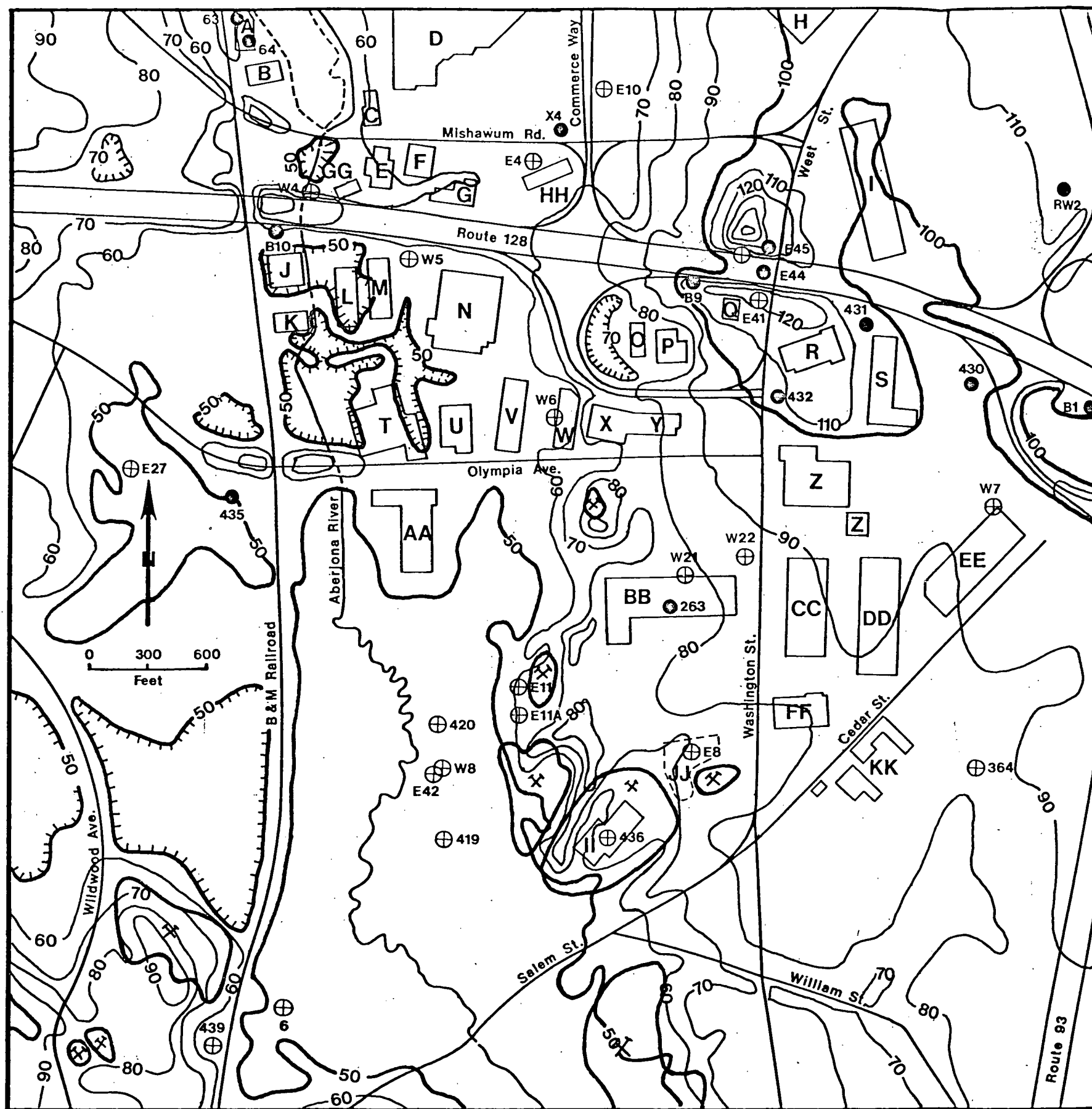
*

Figure 2-4 is a contour map of the water table showing the directions of groundwater flow. This map is reproduced from an earlier E & E report (8) with minor modifications resulting from incorporation of water table measurements from the newly installed EPA and MDC wells.

The water table configuration resembles the ground surface and bedrock surface configurations for the study area. Groundwater flows from the west and east portions of the study area toward the Aberjona River Valley and then to the south as shown in Figure 2-4.

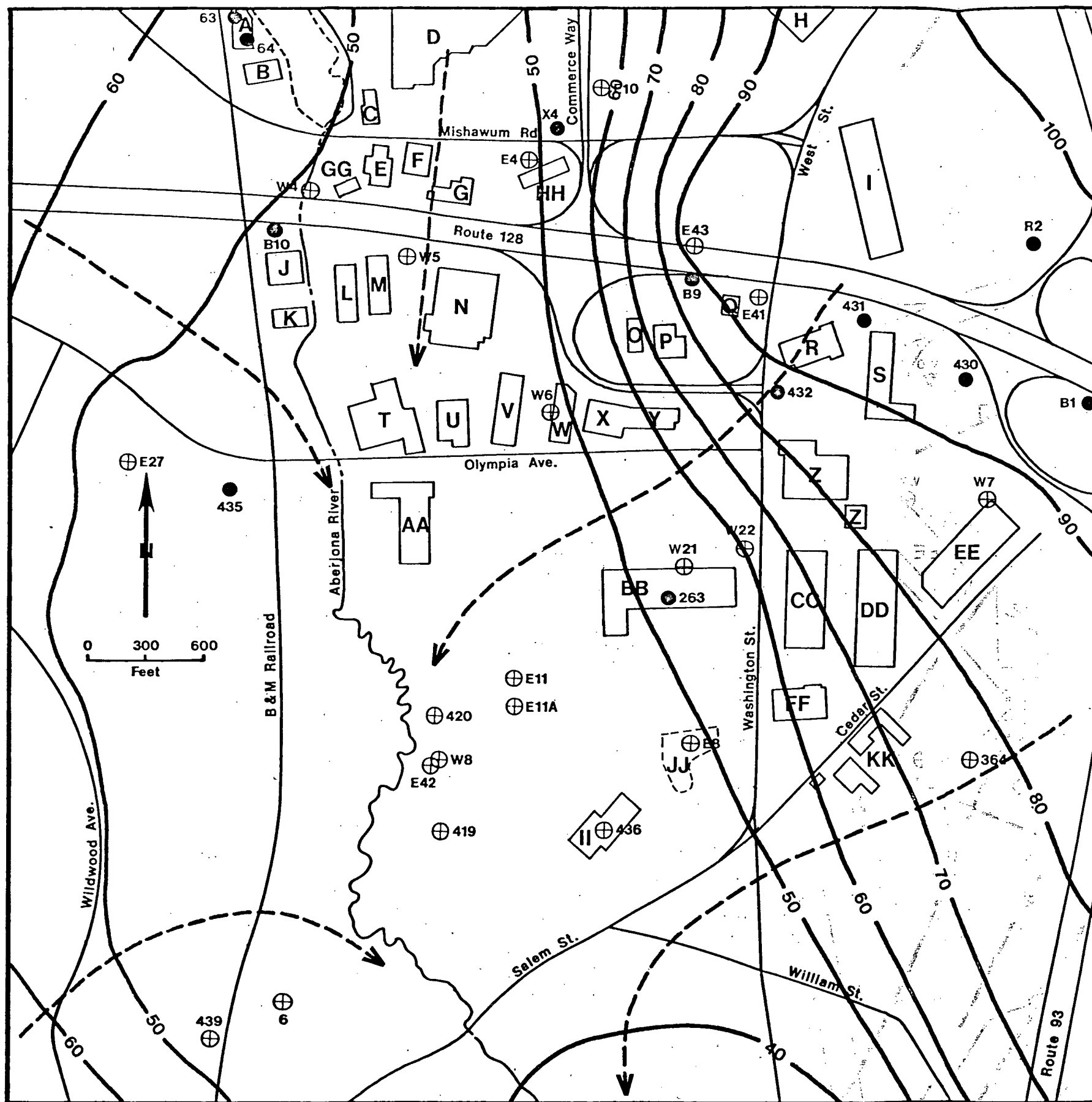
2.6 BEDROCK SURFACE CONFIGURATION

A contour map of the bedrock surface is presented in Figure 2-5. This map is reproduced from an earlier E & E report (8) with minor modifications based on bedrock corings performed during the installation of monitoring wells within the study area.



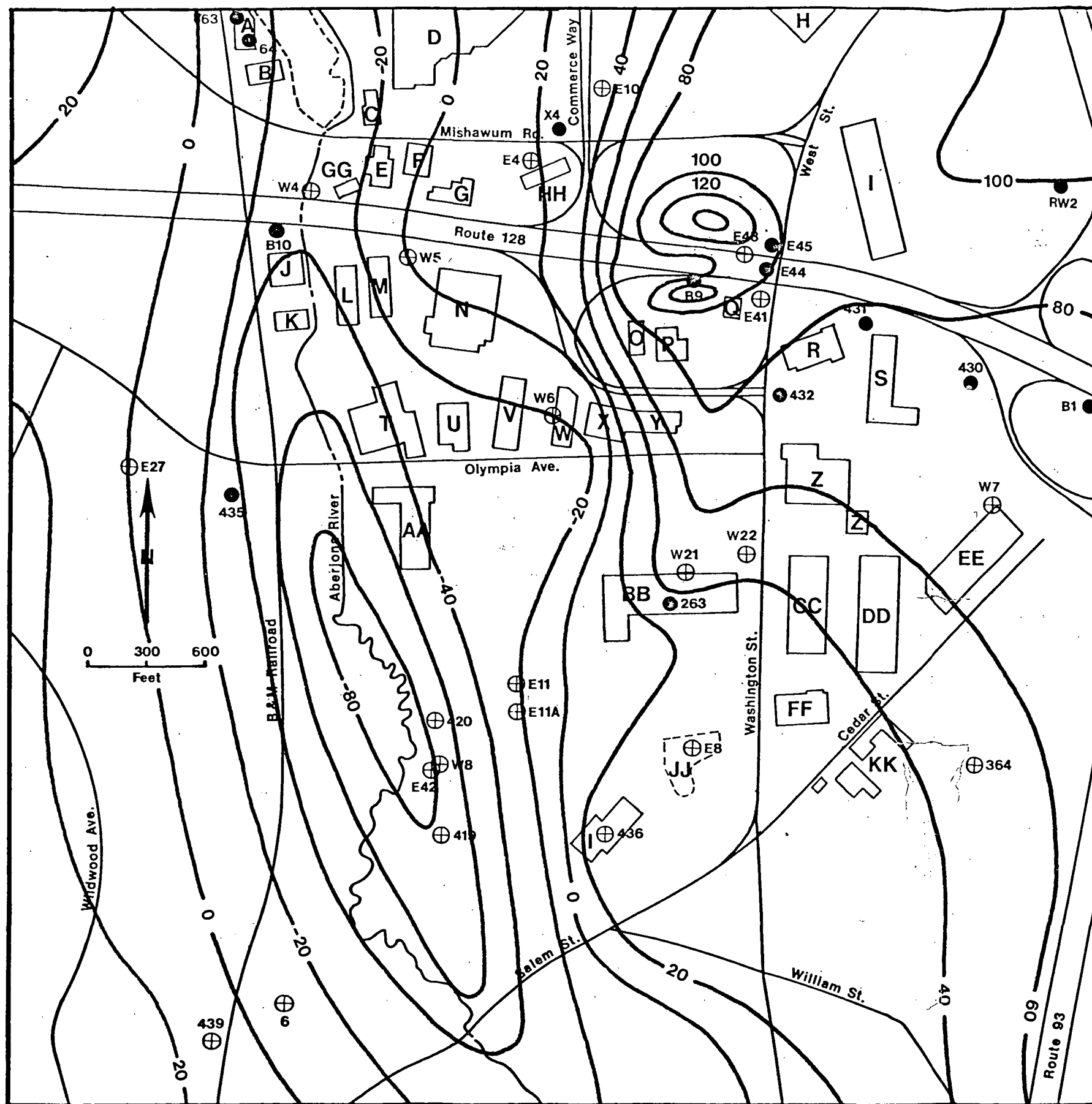
**FIGURE 2-3: SURFACE TOPOGRAPHY
10 FOOT CONTOUR INTERVAL, MSL**

(X) Gravel Pit



**FIGURE 2-4: WATER TABLE CONFIGURATION
10 FOOT CONTOUR INTERVAL, MSL**

---> Groundwater Flow
Direction



**FIGURE 2-5: BEDROCK SURFACE CONFIGURATION
20 FOOT CONTOUR INTERVAL, MSL**

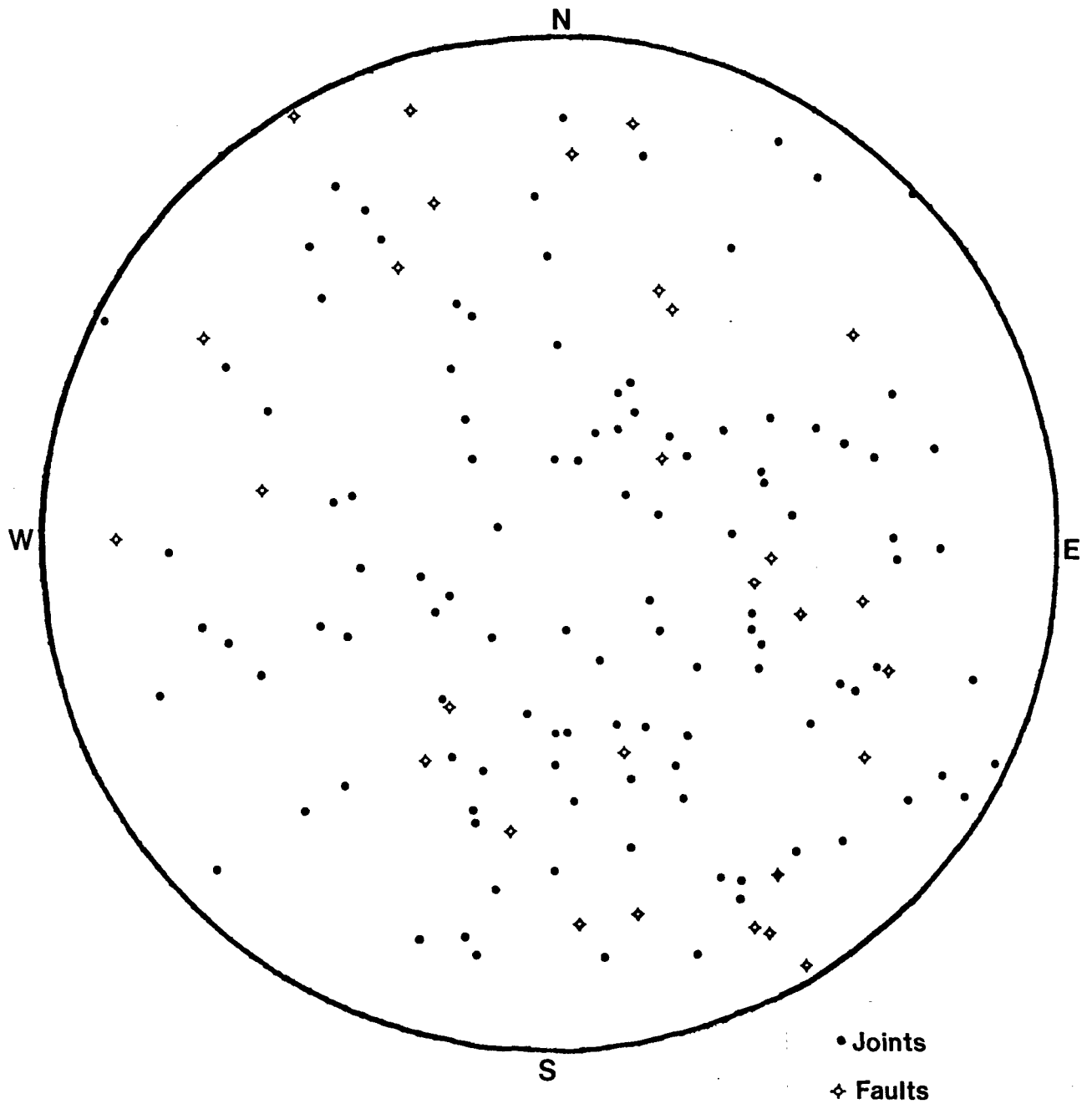
2.6 Bedrock Surface Configuration - continued

The bedrock surface is dominated by a N-S trending trench with the rock surface rising rapidly to the east and west. Wells "G" and "H" are located near the deepest part of the trench. A bedrock high is present just south of the study area and may act as a barrier to contaminant migration southward from Wells "G" and "H".

2.7 BEDROCK GEOLOGY

Bedrock cores were obtained during drilling of wells W-4, 5, 6, 7, 8, 21 and 22. These cores indicate that the primary rock type in the area is Salem Gabbrodiorite. The core for well W-4 consists of Dedham Granodiorite and most likely represents an isolated lens of granodiorite within the gabbrodiorite. All of the rock cores show extensive fracturing, and wells W-4, 8 and 22 apparently intersect faults. In order to determine the primary directions of fracturing and faulting, a survey of available outcrops is being performed, and the orientation of planar features is being plotted using a Brunton pocket transit followed by stereographic projection. All measurements taken to date are plotted on Figure 2-6 and contoured on Figures 2-7 and 2-8. The contour diagram of joint surfaces (Figure 2-7) indicates some preferred orientation striking N75°W and dipping from 60°SW to 15°NE. In general, the joint surfaces have a wide range of orientations and very likely were formed as shrinkage cracks during the cooling of the gabbrodiorite intrusion. The contour diagram of the fault surfaces shows a distinct orientation striking N0-30°E and dipping steeply (85°NW).

Thin sections have been made of the bedrock cores obtained during the monitoring well installations. Preliminary evaluation of these sections confirms the presence of faults near wells W-4, 5, 8, 21 and 22. Considerable cataclasis (deformation resulting from fracturing and rotation of mineral grains) and alteration minerals commonly associated with faulting are present in the sections. There appears to be a major fault striking N-S under the Aberjona River Valley and several associated faults striking N-S to N30°E within the study area.



**FIGURE 2-6: STEREOGRAPHIC PROJECTION PLOTS OF THE POLES
TO 111 JOINT AND 29 FAULT SURFACES
EAST CENTRAL WOBURN, MA.**

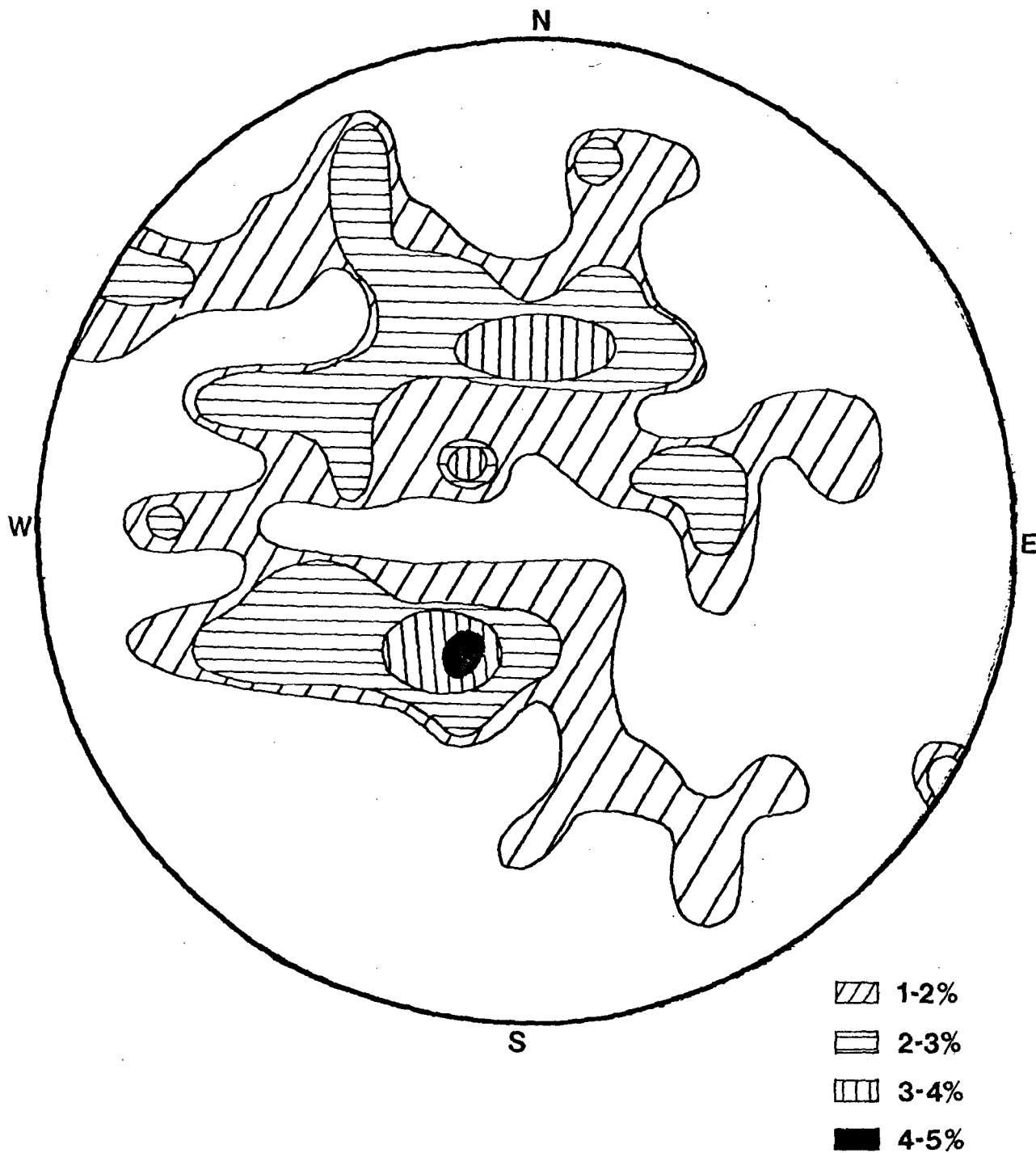
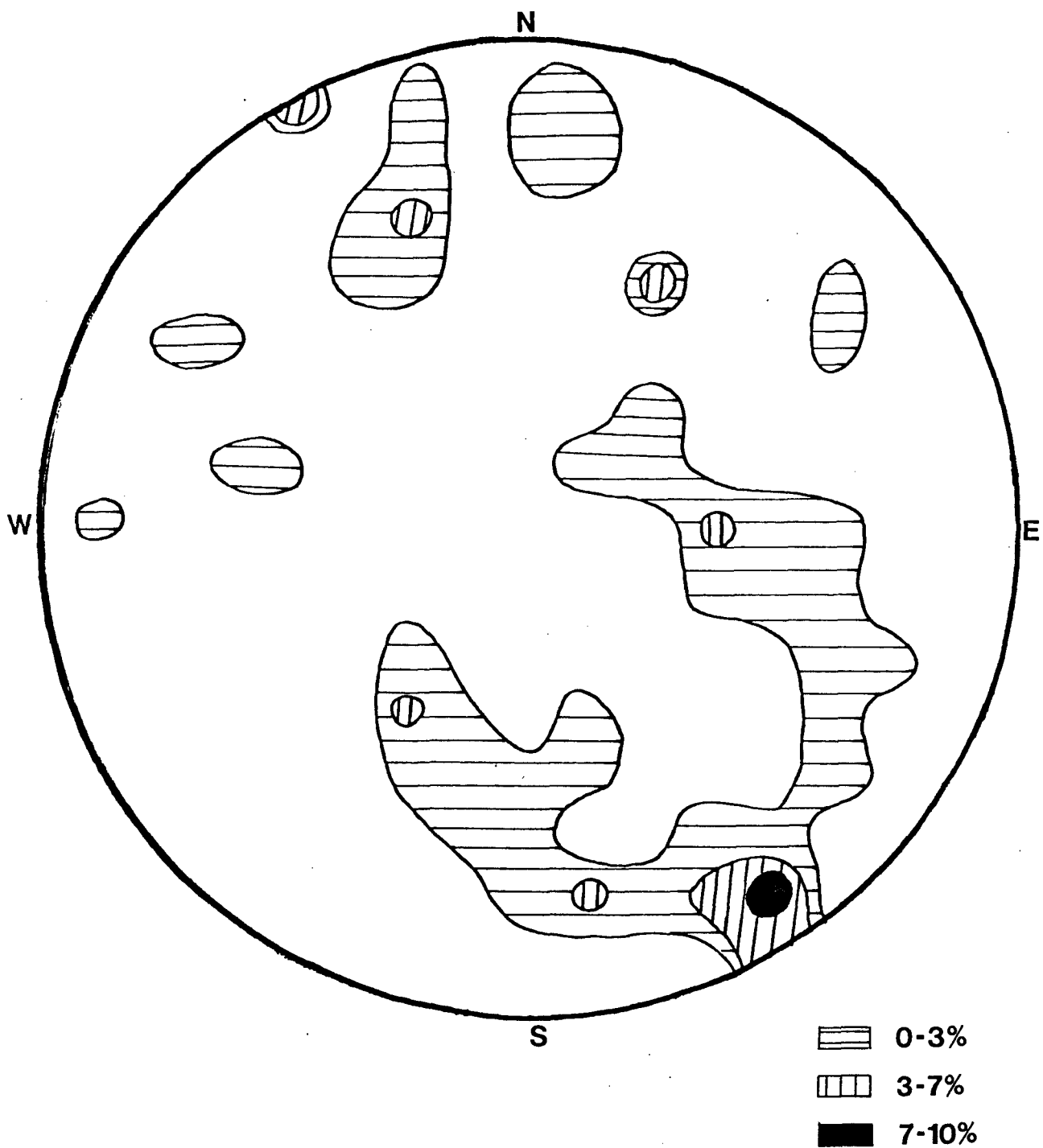


FIGURE 2-7: CONTOUR DIAGRAM OF THE POLES TO 111 BEDROCK JOINTS- EAST CENTRAL WOBURN, MA.



**FIGURE 2-8: CONTOUR DIAGRAM OF THE POLES TO 29 FAULTS
EAST CENTRAL WOBURN, MA.**

2.7 Bedrock Geology - continued

The final report on the geology, hydrogeology and groundwater quality of East and North Woburn (TDD #F1-8109-02) will contain a geologic map of the study area. This map will be available in March 1982.

SECTION 3 - SAMPLING AND ANALYTICAL DATA

3.1 PRIORITY POLLUTANT SAMPLING AND ANALYSES (11/12/80 - 3/02/81)

E & E sampled 32 accessible wells in East and North Woburn (TDD #F1-8010-04A) between 12 November 1980 and 2 March 1981. These samples were subsequently analyzed for priority pollutants, and the sampling and analytical techniques and results are reported in Reference 9. Of the 32 wells sampled, ten are located within the East Central Woburn study area. Table 3-1 summarizes the analytical data for these ten wells. The compounds present in concentrations greater than ten parts per billion are 1,1,1-trichloroethane, 1,2-trans-dichloroethylene, tetrachloroethylene and trichloroethylene. Chloroform and trichlorotrifluoroethane mentioned in Section 1 were not detected. Trichlorotrifluoroethane is not a priority pollutant and may have been present but not analyzed for by the laboratory.

3.2 SAMPLING AND VOLATILE ORGANIC ANALYSES (11/4/81 - 11/5/81)

As part of the monitoring well installation program in East and North Woburn (TDD #F1-8010-03A), seven monitoring wells (W-4, 5, 6, 7, 8, 21 and 22) were installed by E & E within the East Central Woburn study area. An additional well, E-41, was installed by Haley and Aldrich of Cambridge, Massachusetts for the Metropolitan District Commission (MDC). These eight wells plus six other accessible wells within the study area were sampled by E & E on 3 November 1981 using approved EPA methods. The samples were analyzed on 4 and 5 November 1981 at the EPA New England Regional Laboratory (NERL) in Lexington, Massachusetts. The results of these analyses are summarized in Table 3-2, and the analytical conditions are given in Appendix B. 1,1,1-Trichloroethane, 1,2-trans-dichloroethylene, trichloroethylene and tetrachloroethylene are again the primary chlorinated solvents present. A significant concentration (170 ppb) of a compound tentatively identified as acetone was detected in one well (W-5).

TABLE 3-1

Results of Analysis - Volatile Organics (ppb) (9)

11/12/80 - 3/02/81

	<u>Well Number</u>									
	6	364	419"G"	420"H"	436	439	E8	E27	E11	E11A
1,1,1-trichloroethane	133	ND	ND	<10	ND	28	ND	ND	<10	<10
1,2-trans-dichloroethylene	116	ND	14	21	<10	12	ND	<10	210	120
tetrachloroethylene	28	ND	36	41	12	ND	ND	ND	89	63
trichloroethylene	1372	ND	210	73	12	53	<10	19	280	160
Benzene	ND	ND	<10	<10	<10	ND	<10	<10	<10	<10
Chlorobenzene	ND	ND	ND	ND	ND	<10	ND	ND	ND	ND

TABLE 3-2

Results of Analysis - Volatile Organics (ppb)

November 4, 5, 1981

	<u>Well Number</u>													
	E41	W436A	E27	E11	E11A	W6	E8	W436	W4	W5	W22	W21	W8	W7
1,2-trans-dichloroethylene	ND	8	ND	160	110	10	ND	4	ND	ND	52	420	10	ND
trichloroethylene	ND	19	ND	240	160	5	ND	18	ND	<1	170	520	55	ND
tetrachloroethylene	ND	17	ND	140	85	240	ND	20	ND	2	4	98	20	ND
toluene	ND	ND	ND	ND	ND	20	ND	ND	ND	5	ND	ND	ND	ND
chloroform	ND	ND	ND	ND	ND	ND	1	ND	ND	1	ND	ND	ND	ND
1,1,1-trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	110	ND	ND	ND	ND
methylene chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	13	ND	ND	ND	ND
1,1-dichloroethylene	ND	ND	ND	ND	ND	ND	ND	ND	ND	2	ND	ND	ND	ND
acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	170	ND	ND	ND	ND
methyl isopropyl ketone	ND	ND	ND	ND	ND	ND	ND	ND	ND	15	ND	ND	ND	ND

* See Appendix B for analytical conditions for these data

SECTION 4 - EVALUATION OF ANALYTICAL DATA

Figures 4-1 through 4-4 are plots of the known areal extent of contamination for the four primary chlorinated solvents detected in the groundwater within the East Central Woburn study area. Data from both sampling efforts (See Sections 3.1 and 3.2) were used in constructing these maps. Analyses of 4 and 5 November 1981, preempted earlier analyses of the same wells. Data for wells sampled during both efforts were consistent.

Based upon the groundwater flow directions (Figure 2-4) and the areal extent of contamination plots (Figures 4-1 through 4-4), E & E concluded that the primary sources of the chlorinated solvents present in wells "G" and "H" lie to the north and northeast of these wells.

The plots for trichloroethylene and 1,2-trans-dichloroethylene (Figures 4-2 and 4-4) are similar. The plumes are distinctly oriented in a NE-SW direction and each plume has two areas of high solvents concentration (>300 ppb); one at well W-22, approximately 1200 feet northeast of wells "G" and "H" and one at well 6, which is located an equal distance southwest of these wells. The high concentrations at well 6 are likely because this well has the highest pumping rate within the study area (approximately 500,000 gpd). The high solvents concentrations at well W-21 indicate a contaminant source area to the northeast of that well. Chemical screening of split spoon samples collected every five feet during drilling detected no contamination in the overburden. It is likely that the solvents are migrating within the bedrock, possibly along a fault which intersects wells W-21 and W-22 and which trends northeast-southwest. *

The areal plot for 1,1,1-trichloroethane is also distinctly linear, trending N-S and having two areas of high contaminant concentration (100-200 ppb). Well 6 is again an area of high concentration for the reason mentioned earlier. Well W-5 also contains a high concentration of 1,1,1-trichloroethane indicating a contaminant source north of that well. Again, no solvents were detected in the overburden during drilling indicating that contamination is migrating within the bedrock, possibly along a fault trending N-S. *

- A. AVA - Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall - Commercial
- E. Arlwood, Inc. - Wood/Metal doors, hardware
- F. Brodie, Inc. - Industrial trucks, tractors
- G. Brodie, inc. - Industrial trucks, tractors
- H. Post Office
- I. Bradlee's - Commercial
- J. Celotex Corporation - Warehouse
- K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
- L. ADAP/Kamco. - Commercial, auto parts
- M. Waterbed Warehouse - Commercial
- N. Charrette - Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company - Tire distributor
- Q. Bliss marine - Boating equipment
- R. Hurlbert Datsun - Automobile sales and repair
- s. Cummings Industrial Centers - Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products - Hospital equipment
- V. Cummings Industrial Centers - Offices
- W. Cummings Industrial Centers - Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace - Food wrapping equipment
- AA. Hemingway Transportation, Inc. - General commodities trucking
- BB. Cummings Industrial Centers - Offices
- CC. Cummings Industrial Centers - Offices
- DD. Cummings Industrial Centers - Offices
- EE. Cummings Industrial Centers - Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics - Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

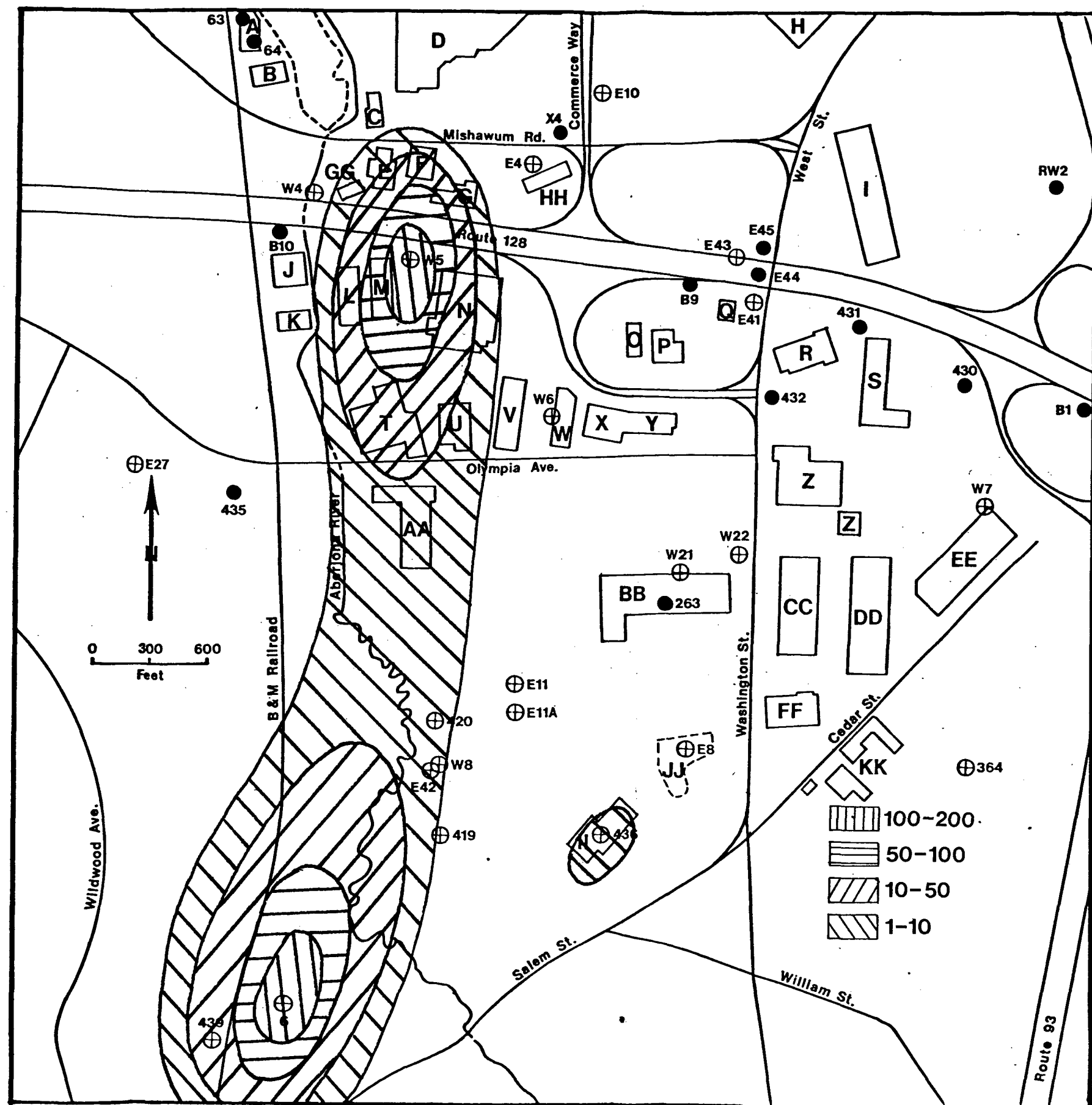


FIGURE 4-1: AREAL DISTRIBUTION OF 1,1,1-TRICHLOROETHANE (ppb)

- A. AVA - Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall - Commercial
- E. Arlwood, Inc. - Wood/Metal doors, hardware
- F. Brodie, Inc. - Industrial trucks, tractors
- G. Brodie, inc. - Industrial trucks, tractors
- H. Post Office
- I. Bradlee's - Commercial
- J. Celotex Corporation - Warehouse
- K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
- L. ADAP/Kamco. - Commercial, auto parts
- M. Waterbed Warehouse - Commercial
- N. Charrette - Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company - Tire distributor
- Q. Bliss marine - Boating equipment
- R. Hurlbert Datsun - Automobile sales and repair
- s. Cummings Industrial Centers - Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products - Hospital equipment
- V. Cummings Industrial Centers - Offices
- W. Cummings Industrial Centers - Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace - Food wrapping equipment
- AA. Hemingway Transportation, Inc. - General commodities trucking
- BB. Cummings Industrial Centers - Offices
- CC. Cummings Industrial Centers - Offices
- DD. Cummings Industrial Centers - Offices
- EE. Cummings Industrial Centers - Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics - Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

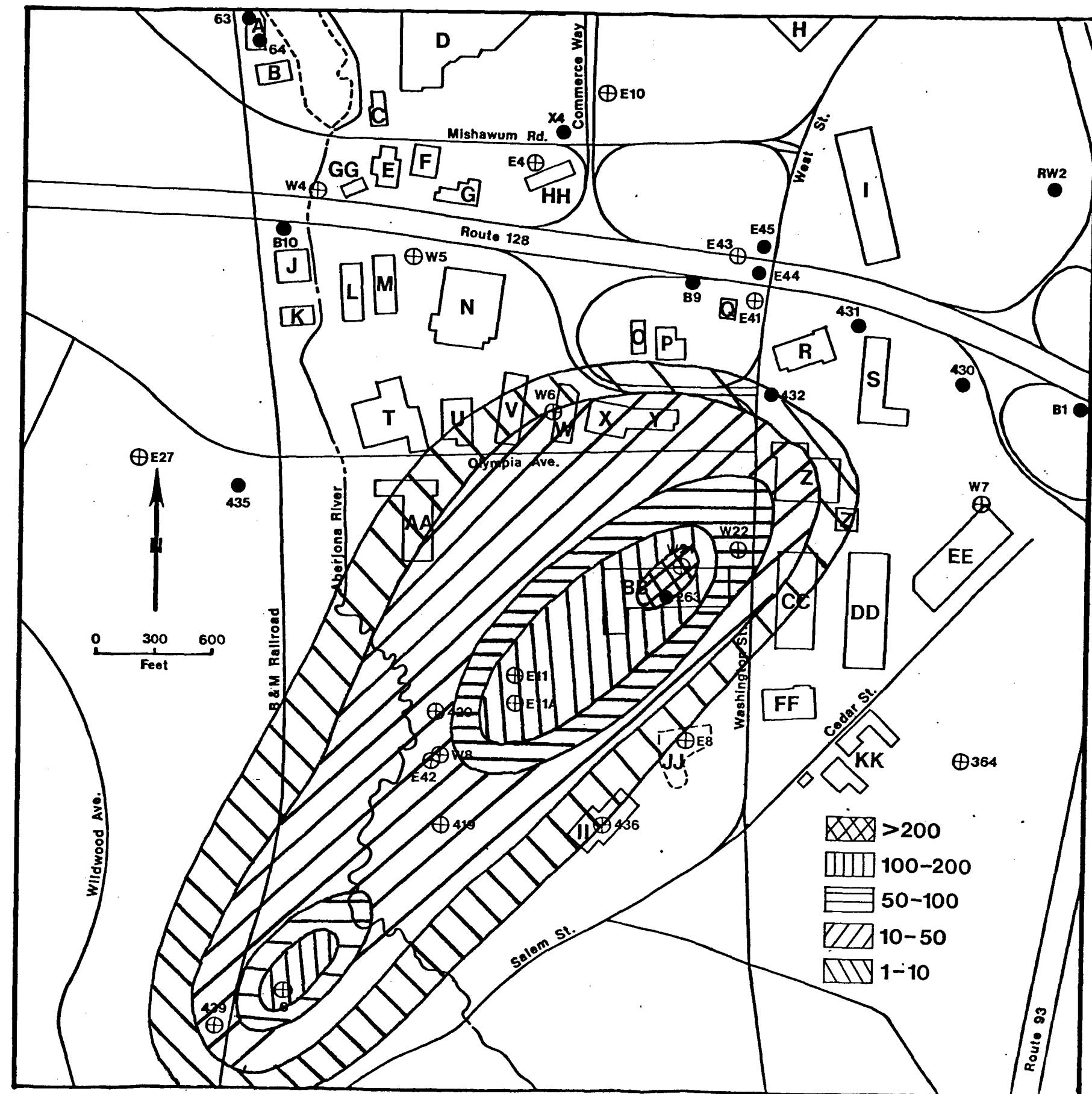


FIGURE 4-2: AREAL DISTRIBUTION OF 1,2-TRANS-DICHLOROETHYLENE [ppb]

- A. AVA - Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall - Commercial
- E. Arlwood, Inc. - Wood/Metal doors, hardware
- F. Brodie, Inc. - Industrial trucks, tractors
- G. Brodie, inc. - Industrial trucks, tractors
- H. Post Office
- I. Bradlee's - Commercial
- J. Celotex Corporation - Warehouse
- K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
- L. ADAP/Kamco. - Commercial, auto parts
- M. Waterbed Warehouse - Commercial
- N. Charrette - Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company - Tire distributor
- Q. Bliss marine - Boating equipment
- R. Hurlbert Datsun - Automobile sales and repair
- s. Cummings Industrial Centers - Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products - Hospital equipment
- V. Cummings Industrial Centers - Offices
- W. Cummings Industrial Centers - Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace - Food wrapping equipment
- AA. Hemingway Transportation, Inc. - General commodities trucking
- BB. Cummings Industrial Centers - Offices
- CC. Cummings Industrial Centers - Offices
- DD. Cummings Industrial Centers - Offices
- EE. Cummings Industrial Centers - Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics - Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company

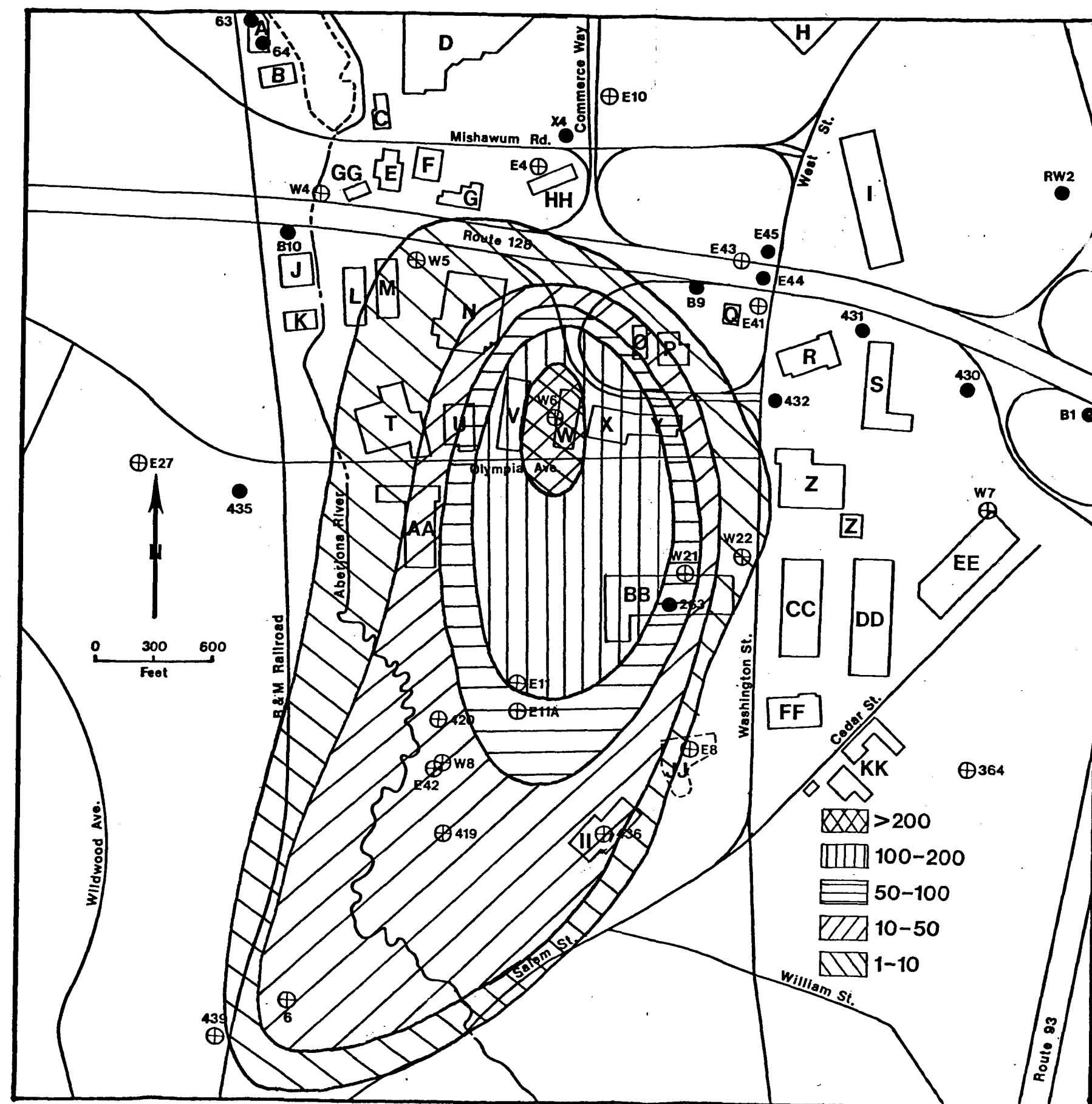
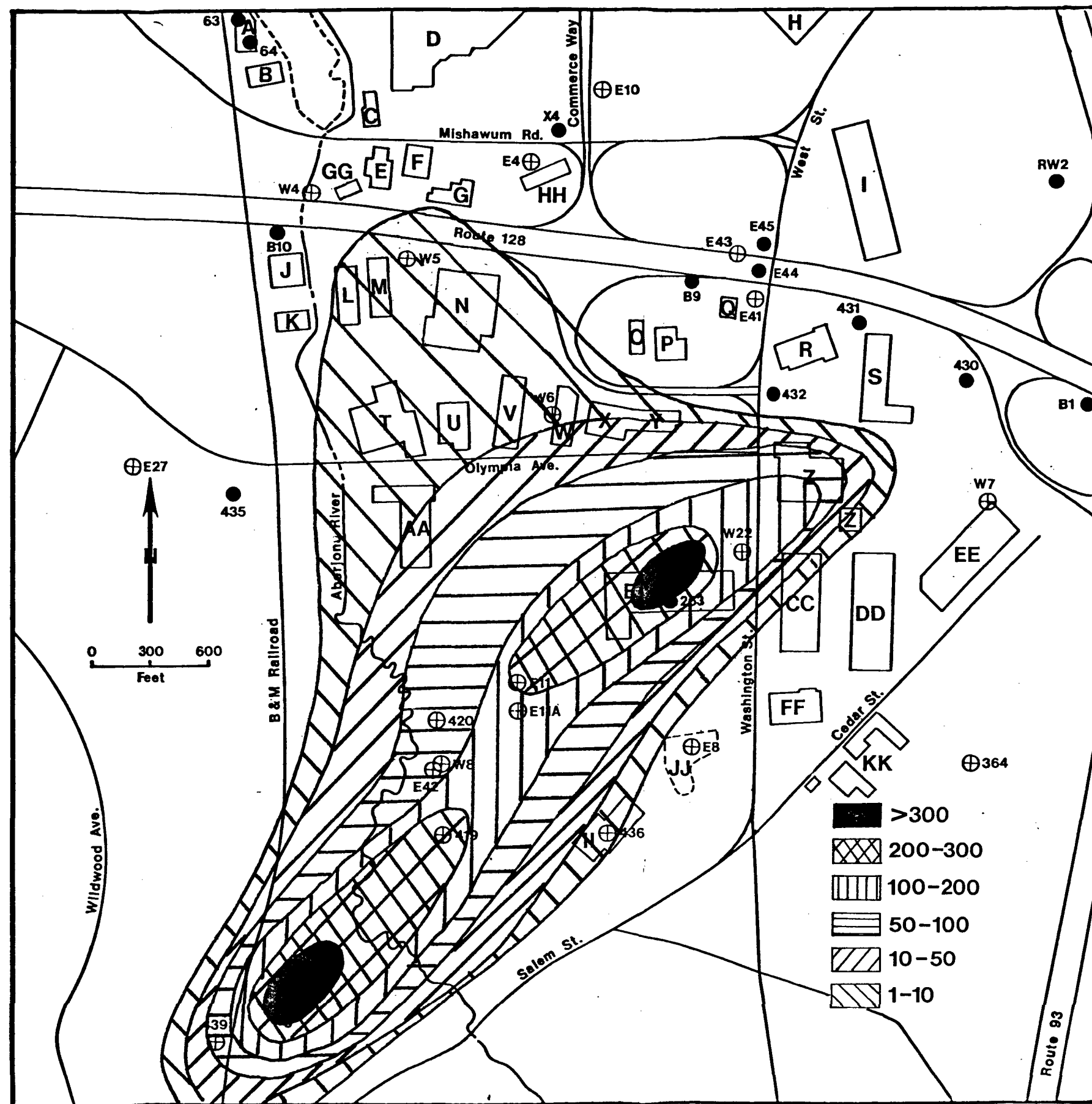


FIGURE 4-3: AREAL DISTRIBUTION OF TETRACHLOROETHYLENE [ppb]

- A. AVA - Warehouse
- B. Bachman Distributing Co.-Food distribution
- C. Allied Van Lines
- D. Woburn Mall - Commercial
- E. Arlwood, Inc. - Wood/Metal doors, hardware
- F. Brodie, Inc. - Industrial trucks, tractors
- G. Brodie, inc. - Industrial trucks, tractors
- H. Post Office
- I. Bradlee's - Commercial
- J. Celotex Corporation - Warehouse
- K. Economics Lab, Inc. - Distributor of soap and cleaning compounds
- L. ADAP/Kamco. - Commercial, auto parts
- M. Waterbed Warehouse - Commercial
- N. Charrette - Commercial, art supplies
- O. Woburn Foreign Motors
- P. Hogan Tire Company - Tire distributor
- Q. Bliss marine - Boating equipment
- R. Hurlbert Datsun - Automobile sales and repair
- s. Cummings Industrial Centers - Offices
- T. Northern Research and Engineering Corporation
- U. Continental Metal Products - Hospital equipment
- V. Cummings Industrial Centers - Offices
- W. Cummings Industrial Centers - Offices
- X. Interstate Industrial Uniform Rental
- Y. Metro Siding and Roofing
- Z. W. R. Grace - Food wrapping equipment
- AA. Hemingway Transportation, Inc. - General commodities trucking
- BB. Cummings Industrial Centers - Offices
- CC. Cummings Industrial Centers - Offices
- DD. Cummings Industrial Centers - Offices
- EE. Cummings Industrial Centers - Offices
- FF. McKesson and Robbins Drug Company
- GG. 99 Restaurant
- HH. Koala Inn
- II. New England Plastics - Plastics manufacturing
- JJ. Mirra Construction Company, Inc.
- KK. Independent Tallow Company



Section 4 - continued

Figure 4-3, the areal plot of tetrachloroethylene, is characterized by a high concentration (>200 ppb) at well W-6 and decreasing concentrations southward to well 6. This plume configuration indicates a contaminant source north of well W-6. As a high concentration has not yet reached well 6, it is likely that the tetrachloroethylene contamination is of more recent origin than the other solvents.

SECTION 5 - RECOMMENDATIONS FOR FURTHER STUDY

To further define the source or sources of solvents present in the groundwater within the East Central Woburn study area, the following studies are recommended:

- A. An inventory of all solvents used currently or in the past by industries located upgradient of the plumes defined in Section 4 should be performed. Storage and disposal practices of these industries should be carefully evaluated.
- B. Once specific industries have been identified as potential sources, groundwater quality monitoring wells should be appropriately sited and installed using hydrogeologic data for the area generated by previous E & E studies.

SECTION 6 - REFERENCES

1. Priority Pollutant Samples collected by Massachusetts DEQE - 14 May 1979, analyzed by Massachusetts DEQE on 21 May 1979.
2. Priority Pollutant Samples collected by EPA/Lexington - 23 July 1979, analyzed by EPA/Lexington on 24 July 1979.
3. Priority Pollutant Samples collected by Massachusetts DEQE - 24 September 1979, analyzed by Lawrence Experiment Station on 25 and 26 September 1979.
4. Priority Pollutant Samples collected by E & E - 23 January 1981 to 30 January 1981, analyzed by Acurex on 26 February 1981.
5. Cook, D. K. Site Inspection Reports for E. C. Whitney and Sons, Whitney Barrel Company, Ritter Trucking Company, Raffi & Swanson, Inc., MDC Septage Receiving Station, New England Resins and Pigments, Woburn Steel Drum, Inc., and Woburn Sanitary Landfill. EPA FIT Project. TDD F1-8006-01. 28 August - 17 September 1980.
6. Cook, D. K. Site Inspection Report for Olin Chemicals Group Wilmington Plant. EPA FIT Project. TDD #F-8005-01F. 48 pp. 5 December 1980.
7. Cook, D. K. Site Inspection Reports for Severence Trucking Company, Inc., Aberjona Auto Parts, John J. Riley Company, Whitney Barrel Company, Atlantic Gelatin and Independent Tallow Company. EPA FIT Project. TDD #F-8005-01E. 20 November - 17 December 1980.
8. Ecology and Environment, Inc. Interim Report on the Geology and Groundwater of North and East Woburn, Massachusetts. EPA FIT Project. TDD #F1-8010-02A/03A. 3 April 1981.
9. Ecology and Environment, Inc. Interim Report on the Groundwater Quality of East and North Woburn, Massachusetts. EPA FIT Project. TDD #F1-8010-04B.
10. Tufts University Department of Urban and Environmental Policy. Hazardous Wastes in Woburn. Prepared for Reading, Massachusetts Conservation Commission. May 1980.
11. U.S. Geological Survey. 1:25000 Topographic sheets for the Boston North, Wilmington, Reading and Lexington, Massachusetts Quadrangles. 1979 photorevisions.
12. Delaney, F. D., and Gay, F. B. Hydrology and Water Resources of the Coastal Drainage Basins of Northeastern Massachusetts, from Castle Neck River, Ipswich to Mystic River, Boston. U.S. Geological Survey Hydrologic Investigations Atlas No. 589 (1980).

APPENDIX A

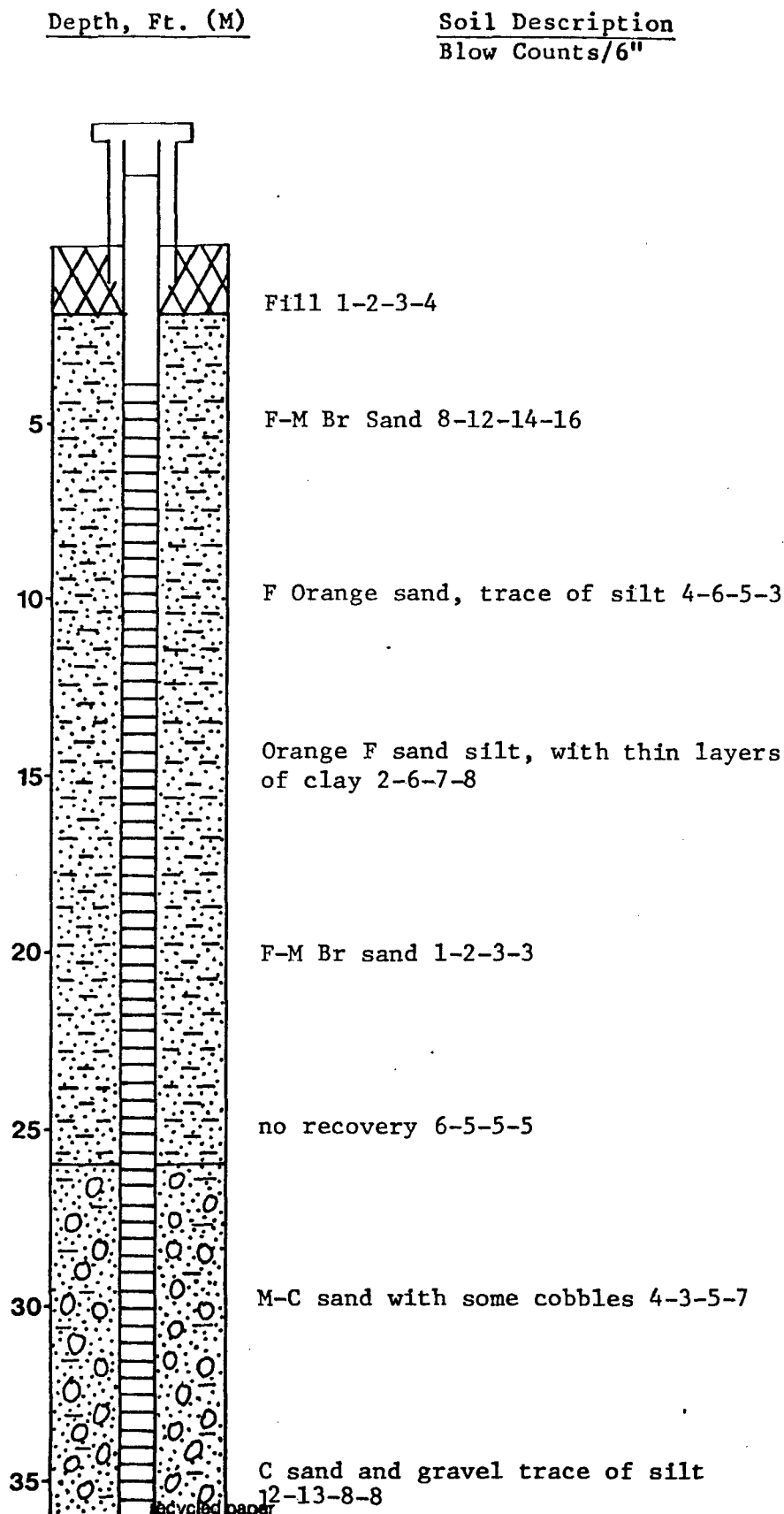
Well Logs for Newly Installed EPA and MDC Wells

in

East Central Woburn, Massachusetts

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley



Well No. W-8
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 45' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/25/81
Type of Rig Truck Mounted

----- WELL DATA -----
Well Diam. 1.4" ID
Depth 128.5'
Screen Diam. 1.4" ID
Screen Setting 4'-128.5'
Screen Type Schedule 80 PVC
0.01" Slot

Well Type Monitoring
Static Water Level 2' MSL
Date Measured 10/30/81

----- WATER QUALITY -----
Samples Taken Yes ☒ No ☐
No. of Samples
Type of Samples Priority
Pollutants

Date Sampled 11/30/81
Samplers Porter and Fucarile
Will be Analyzed for

Sampled for Volatile.
Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-8
Location

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot

Well Type Monitoring
Static Water Level
Date Measured

WATER QUALITY

Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

40	C sand and gravel trace of silt 13-10-12-15
45	C sand and gravel some sand 14-11-11-11
50	Br. C sand and gravel some silt 24-26-76-50
55	Gr. gravel, some sand and silt 17-21-26-36
60	C Gr sand with trace of silt (few thin layers) grading to fine silt and clay 29-30-36-30
65	Gr silt, sand and gravel, trace of clay 34-50-66-78
70	T sand and gravel, some silt, trace of clay 141-187
75	No Recovery wash-med-fine sand 8-25-47-80

recycled paper

ecology and environment, inc.

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-8

Location

Owner U.S. EPA

Ground Elev.

Driller Geo-Metrics, Inc.

Drilling Completed

Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID

Depth

Screen Diam. 1.4" ID

Screen Setting

Screen Type Schedule 80 PVC

0.01" Slot

Well Type Monitoring

Static Water Level

Date Measured

WATER QUALITY

Samples Taken Yes No

No. of Samples

Type of Samples

Date Sampled

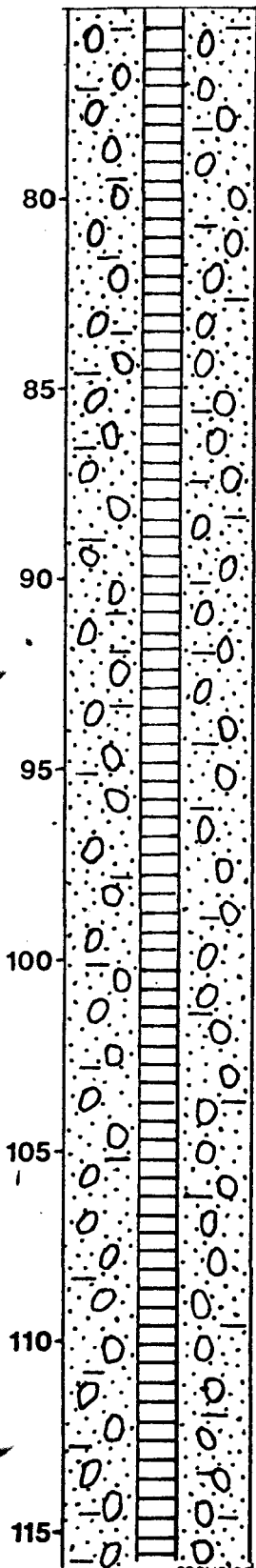
Samplers

Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red



Br-T sand and gravel, trace of clay
25-40-40-40

Br-T C-sand and gravel trace of silt
and clay 10-16-25-25

Br. C-sand and gravel trace of silt
14-15-16-21

no sample recovery 17-28-26-25

T C sand and gravel some silt,
trace of clay 20-47-58-60

Gr. C. sand and gravel some silt,
trace of clay 77-207 for 6"

Gr. C. sand and gravel grading to
fine sand 24-30-33-27

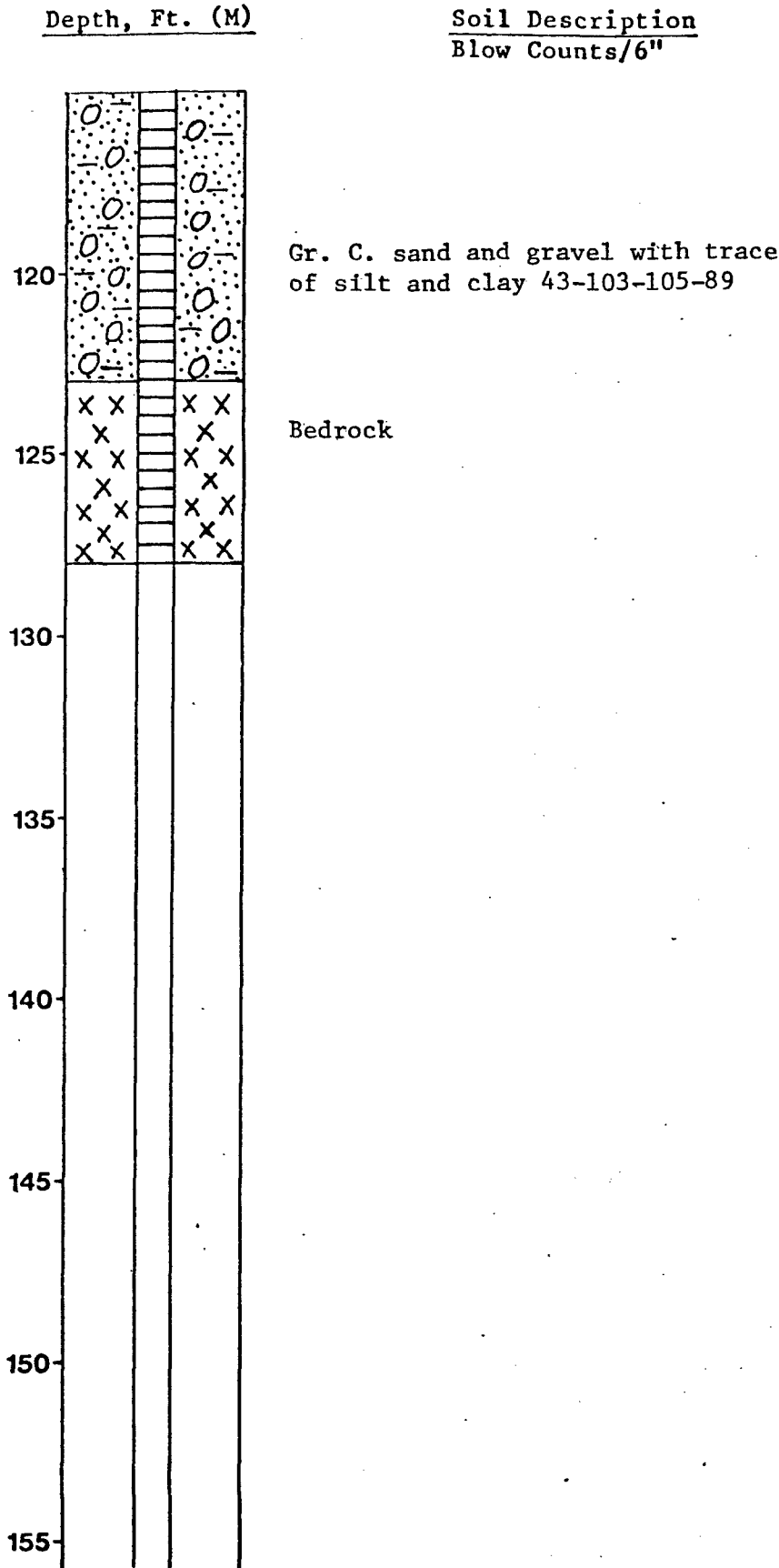
Gr.-T C sand and gravel some silt,
trace of clay 20-23-26-20

recycled paper

ecology and environment, inc.

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 120/4
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley



Well No. W-8
Location
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted
----- WELL DATA -----
Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured
----- WATER QUALITY -----
Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 121
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"	Well No. W-7 Location Woburn, MA
		Owner U.S. EPA Ground Elev. 91' MSL Driller Geo-Metrics, Inc. Drilling Completed 6/24/81 Type of Rig Truck Mounted ----- WELL DATA ----- Well Diam. 1.4" ID Depth 28' Screen Diam. 1.4" ID Screen Setting 4'-28' Screen Type Schedule 80 PVC 0.01" Slot Well Type Monitoring Static Water Level 4'1" Date Measured 10/30/81 ----- WATER QUALITY ----- Samples Taken Yes <input checked="" type="checkbox"/> No No. of Samples Type of Samples Priority Pollutant Date Sampled Samplers Will be Analyzed for Sampled for Volatile Organics 11/3/81 REMARKS SOIL DESCRIPTION ABBREVIATIONS Trace 0-10% C-Coarse Br-brown Some 10-40% M-Medium Bl-black And 40-50% F-Fine Y-yellow T-tan Gr-grey R-red
5	Fill 1-7-11-9 Fill 2-6-8-5	
10	Gr. fine-med sand overlying R-Y clays, silts and sand with angular gravel pieces Till 11-20-23-24	
15	M-C Br. sand trace silt over Br.-G. silt sand and cobbles Till 70-48-54-100	
20	Bedrock	
25		
30		
35		

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 122
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W21
Location Woburn, MA

Owner U.S. EPA

Ground Elev.

Driller Geo-Metrics, Inc.

Drilling Completed 9/14/81

Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID

Depth 31.5'

Screen Diam. 1.4" ID

Screen Setting 4'-31.5"

Screen Type Schedule 80 PVC

0.01" Slot

Well Type Monitoring

Static Water Level 19' 4"

Date Measured 10/30/81

WATER QUALITY

Samples Taken Yes ☒ No ☐

No. of Samples

Type of Samples Priority

Pollutant

Date Sampled

Samplers

Will be Analyzed for

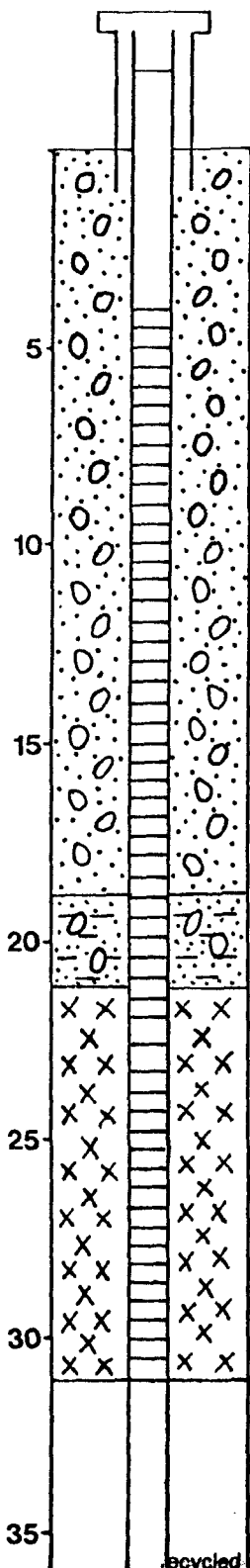
Sampled for Volatile
Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ecology and environment, inc.



Fill 2-4-8-19

Fill 34-30-50-50

Fill, sand and gravel 17-25-35-50

Fill, sand and gravel 42-55-23-30

R-Y clay, silt and sand 28-20-100/5"

R-Y clay, silt and sand w/ some gravel
10-15-50/1"

Bedrock

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 123/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"Well No. W-4Location Woburn, MAOwner U.S. EPAGround Elev. 53.5' MSLDriller Geo-Metrics, Inc.Drilling Completed 7/1/81Type of Rig Truck Mounted

----- WELL DATA -----

Well Diam. 1.4" IDDepth 91'Screen Diam. 1.4" IDScreen Setting 4-91'Screen Type Schedule 80 PVC0.01" SlotWell Type MonitoringStatic Water Level 5' MSLDate Measured 10/30/81

----- WATER QUALITY -----

Samples Taken Yes x No No. of Samples Type of Samples PriorityPollutantDate Sampled 11/30/81Samplers Cook, PorterWill be Analyzed for

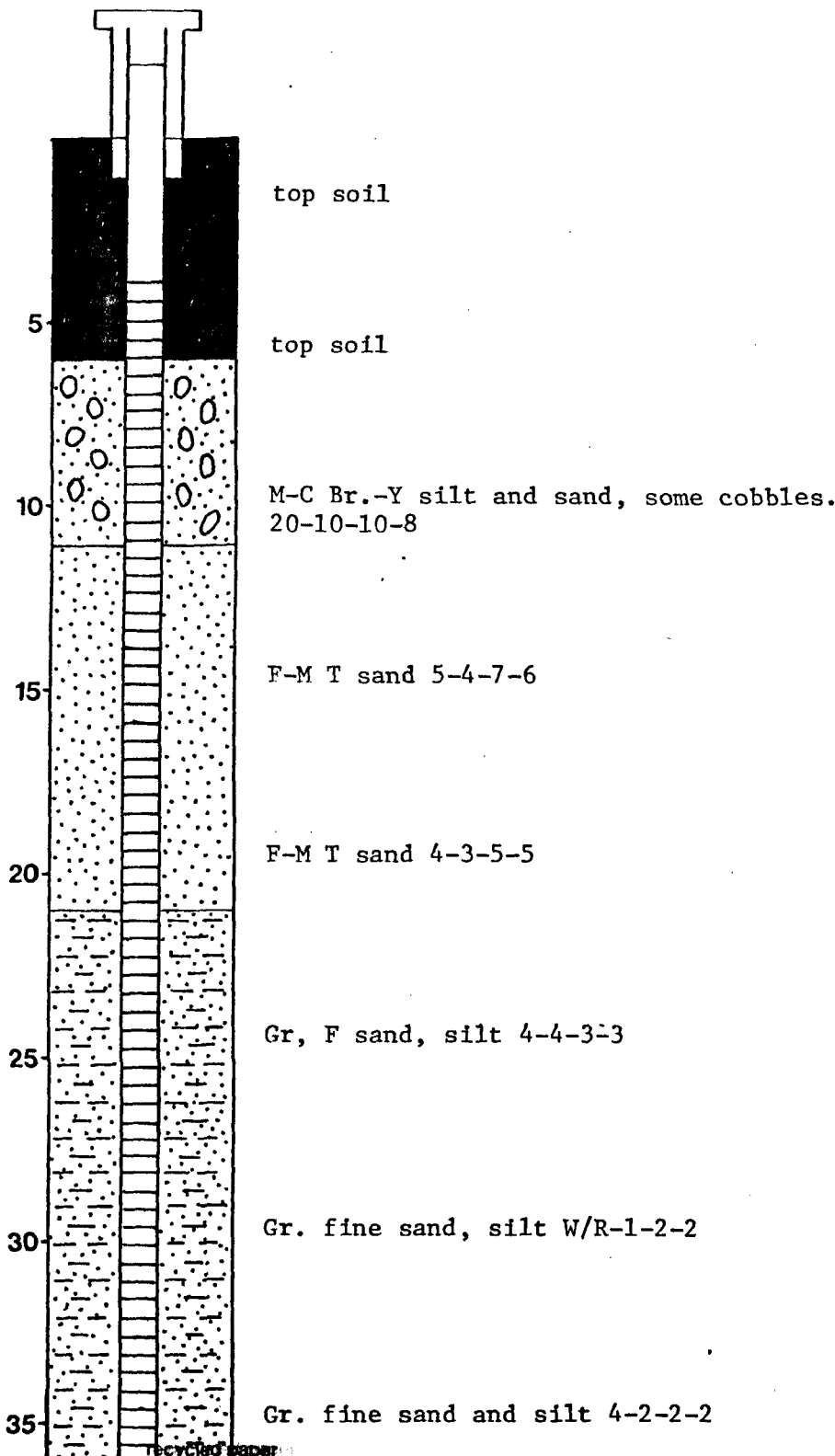
Sampled for Priority Pollutant

Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red



ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 123/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared _____
Prepared By M. Hanley

Depth, Ft. (M)	Soil Description Blow Counts/6"	Well No. <u>W-4</u> Location _____
40	Gr. fine sand and silt 4-10-10-10	Owner <u>U.S. EPA</u> Ground Elev. _____ Driller <u>Geo-Metrics, Inc.</u> Drilling Completed _____ Type of Rig <u>Truck Mounted</u> ----- WELL DATA ----- Well Diam. <u>1.4" ID</u> Depth _____ Screen Diam. <u>1.4" ID</u> Screen Setting _____ Screen Type <u>Schedule 80 PVC</u> <u>0.01" Slot</u> Well Type <u>Monitoring</u> Static Water Level _____ Date Measured _____ ----- WATER QUALITY ----- Samples Taken Yes _____ No _____ No. of Samples _____ Type of Samples _____
45	Gr. fine sand and silt, trace of clay W/R-2-5-7	Date Sampled _____ Samplers _____ Will be Analyzed for _____
50	Gr. fine sand and silt, trace of clay 3-6-4-4	REMARKS
55	Gr. fine sand and silt, trace of clay 6-5-4-4	
60	Gr. fine sand and silt, 5-6-12-10	
65	Gr. fine sand and silt 5-7-6-5	
70	G. fine sand and silt, trace of clay 3-5-5-6	
75	Gr. fine sand and silt 1/W/H-2-3	

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

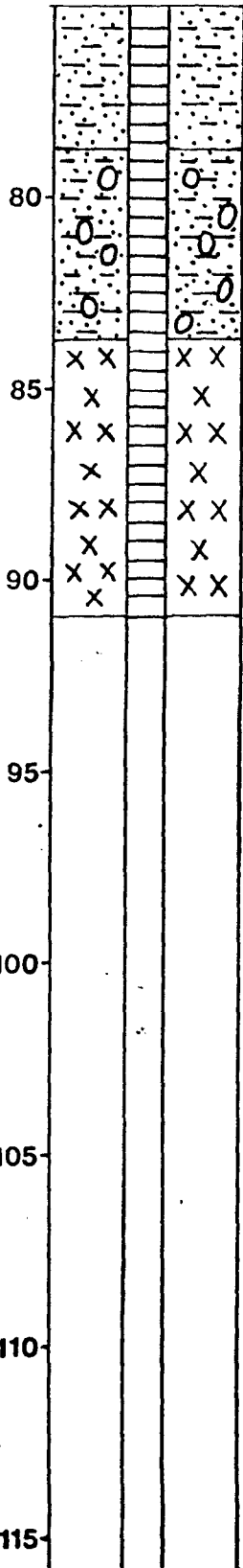
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 123/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-4
Location



Gr. fine sand, silt, trace of gravel
19-18-15-100/2 1/2"

Bedrock

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted
----- WELL DATA -----
Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured
----- WATER QUALITY -----
Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

Well No. W-6
Location Woburn, MA

Type of Samples	Priority	Pollutant
1. Air	1. Carbon monoxide	1. Carbon monoxide
2. Water	2. Lead	2. Lead
3. Soil	3. Nitrogen dioxide	3. Nitrogen dioxide
4. Sediment	4. Ozone	4. Ozone
5. Biota	5. Particulate matter	5. Particulate matter
6. Fish	6. Sulfur dioxide	6. Sulfur dioxide
7. Plants	7. Total suspended particulates	7. Total suspended particulates
8. Invertebrates	8. Volatile organic compounds	8. Volatile organic compounds
9. Mammals	9. Heavy metals	9. Heavy metals
10. Birds	10. Pesticides	10. Pesticides
11. Microorganisms	11. Radionuclides	11. Radionuclides
12. Fungi	12. Other pollutants	12. Other pollutants
13. Bacteria		
14. Viruses		
15. Protozoa		
16. Algae		
17. Fungi		
18. Bacteria		
19. Viruses		
20. Protozoa		
21. Algae		
22. Fungi		
23. Bacteria		
24. Viruses		
25. Protozoa		
26. Algae		
27. Fungi		
28. Bacteria		
29. Viruses		
30. Protozoa		
31. Algae		
32. Fungi		
33. Bacteria		
34. Viruses		
35. Protozoa		
36. Algae		
37. Fungi		
38. Bacteria		
39. Viruses		
40. Protozoa		
41. Algae		
42. Fungi		
43. Bacteria		
44. Viruses		
45. Protozoa		
46. Algae		
47. Fungi		
48. Bacteria		
49. Viruses		
50. Protozoa		
51. Algae		
52. Fungi		
53. Bacteria		
54. Viruses		
55. Protozoa		
56. Algae		
57. Fungi		
58. Bacteria		
59. Viruses		
60. Protozoa		
61. Algae		
62. Fungi		
63. Bacteria		
64. Viruses		
65. Protozoa		
66. Algae		
67. Fungi		
68. Bacteria		
69. Viruses		
70. Protozoa		
71. Algae		
72. Fungi		
73. Bacteria		
74. Viruses		
75. Protozoa		
76. Algae		
77. Fungi		
78. Bacteria		
79. Viruses		
80. Protozoa		
81. Algae		
82. Fungi		
83. Bacteria		
84. Viruses		
85. Protozoa		
86. Algae		
87. Fungi		
88. Bacteria		
89. Viruses		
90. Protozoa		
91. Algae		
92. Fungi		
93. Bacteria		
94. Viruses		
95. Protozoa		
96. Algae		
97. Fungi		
98. Bacteria		
99. Viruses		
100. Protozoa		

Will be Analyzed for

Sampled For Volatile Organics
11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-6
Location

Owner U.S. EPA

Ground Elev.

Driller Geo-Metrics, Inc.

Drilling Completed

Type of Rig Truck Mounted

WELL DATA

Well Diam. 1.4" ID

Depth

Screen Diam. 1.4" ID

Screen Setting

Screen Type Schedule 80 PVC

0.01" Slot

Well Type Monitoring

Static Water Level

Date Measured

WATER QUALITY

Samples Taken Yes No

No. of Samples

Type of Samples

Date Sampled

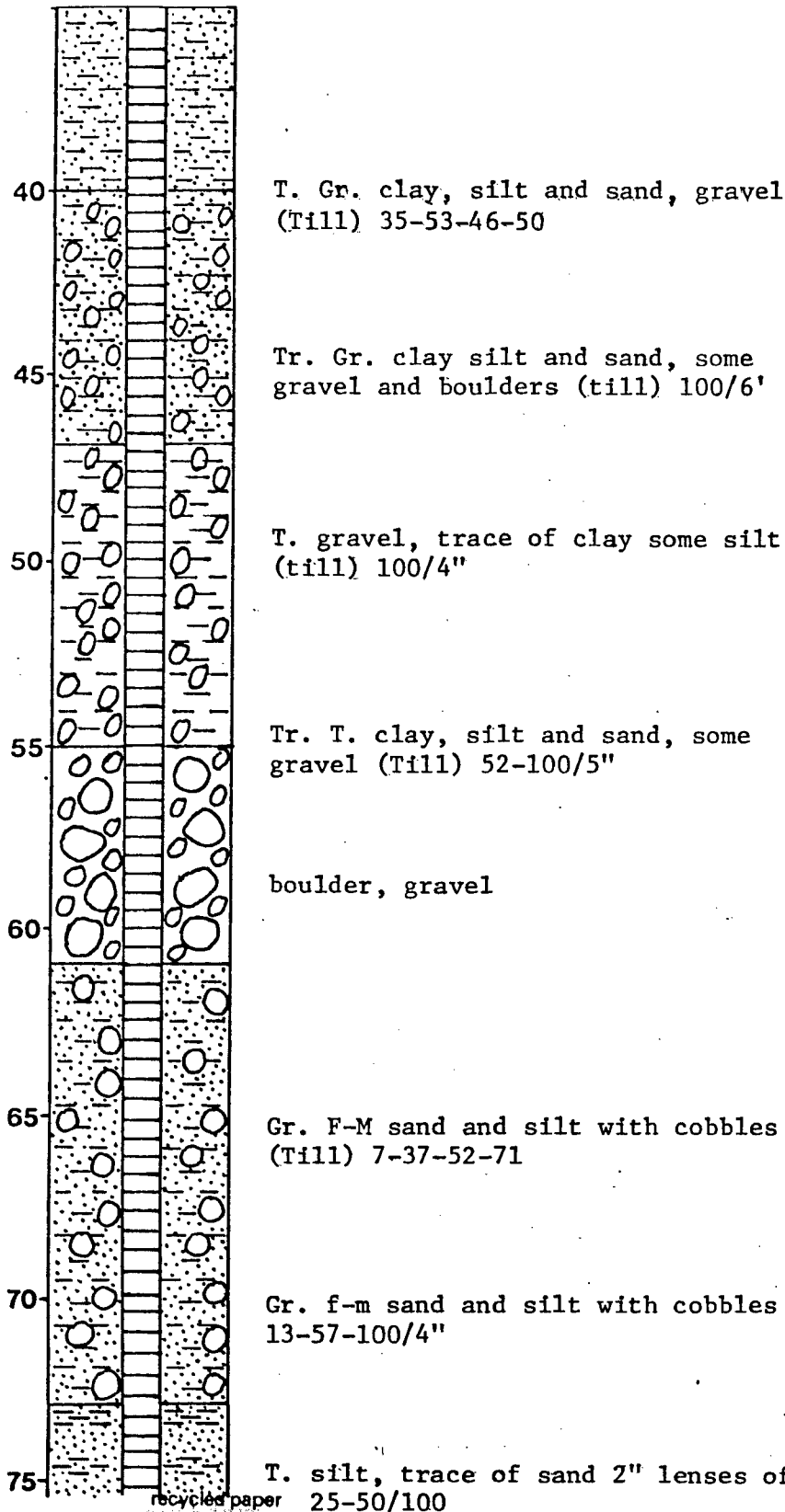
Samplers

Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red



ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 124/3
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared _____
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-6
Location _____

Owner U.S. EPA

Ground Elev. _____

Driller Geo-Metrics, Inc.

Drilling Completed _____

Type of Rig Truck Mounted

----- WELL DATA -----

Well Diam. 1.4" ID

Depth _____

Screen Diam. 1.4" ID

Screen Setting _____

Screen Type Schedule 80 PVC

0.01" Slot

Well Type Monitoring

Static Water Level _____

Date Measured _____

----- WATER QUALITY -----

Samples Taken Yes _____ No _____

No. of Samples _____

Type of Samples _____

Date Sampled _____

Samplers _____

Will be Analyzed for _____

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10% C-Coarse Br-brown

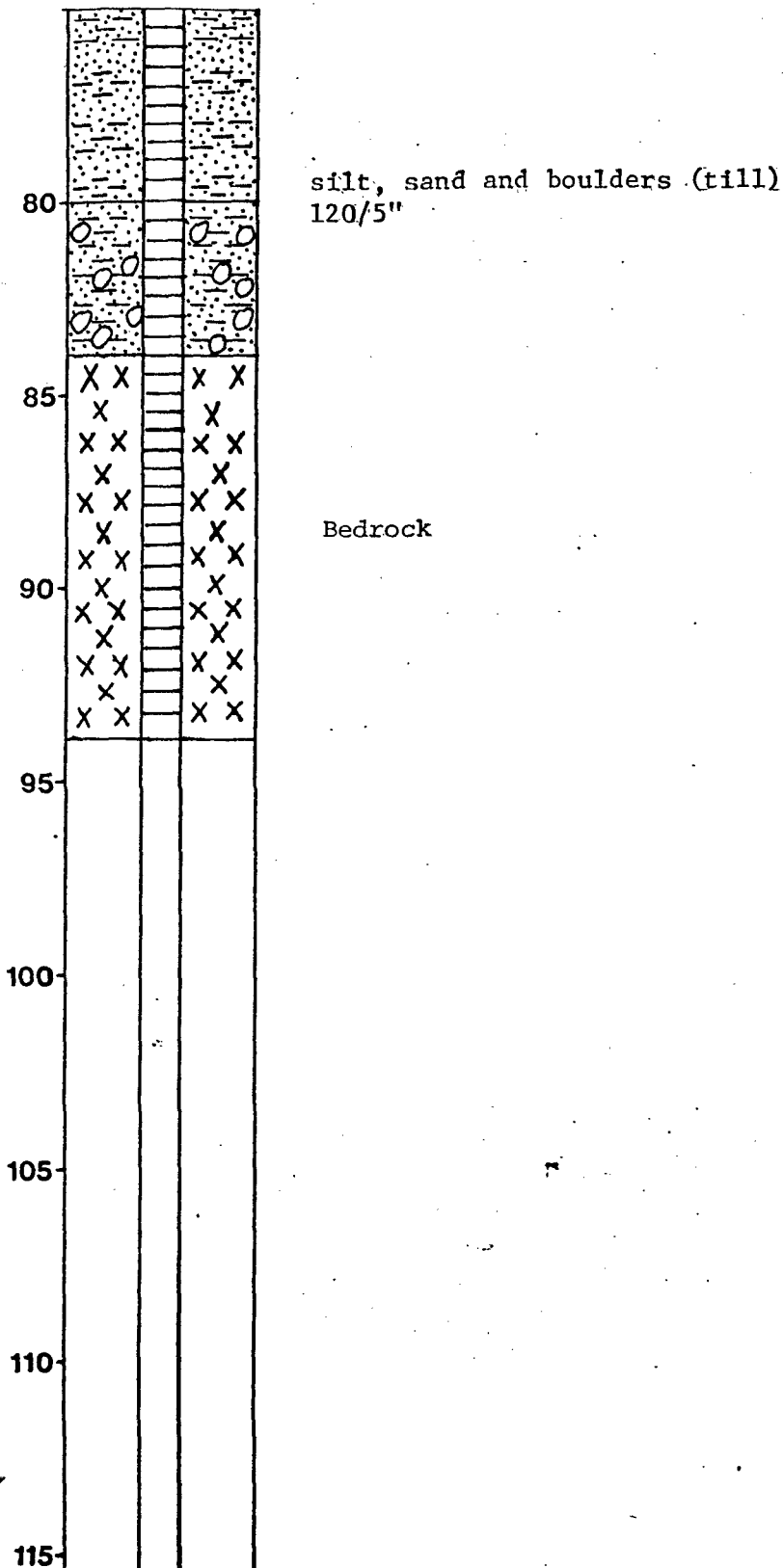
Some 10-40% M-Medium Bl-black

And 40-50% F-Fine Y-yellow

T-tan

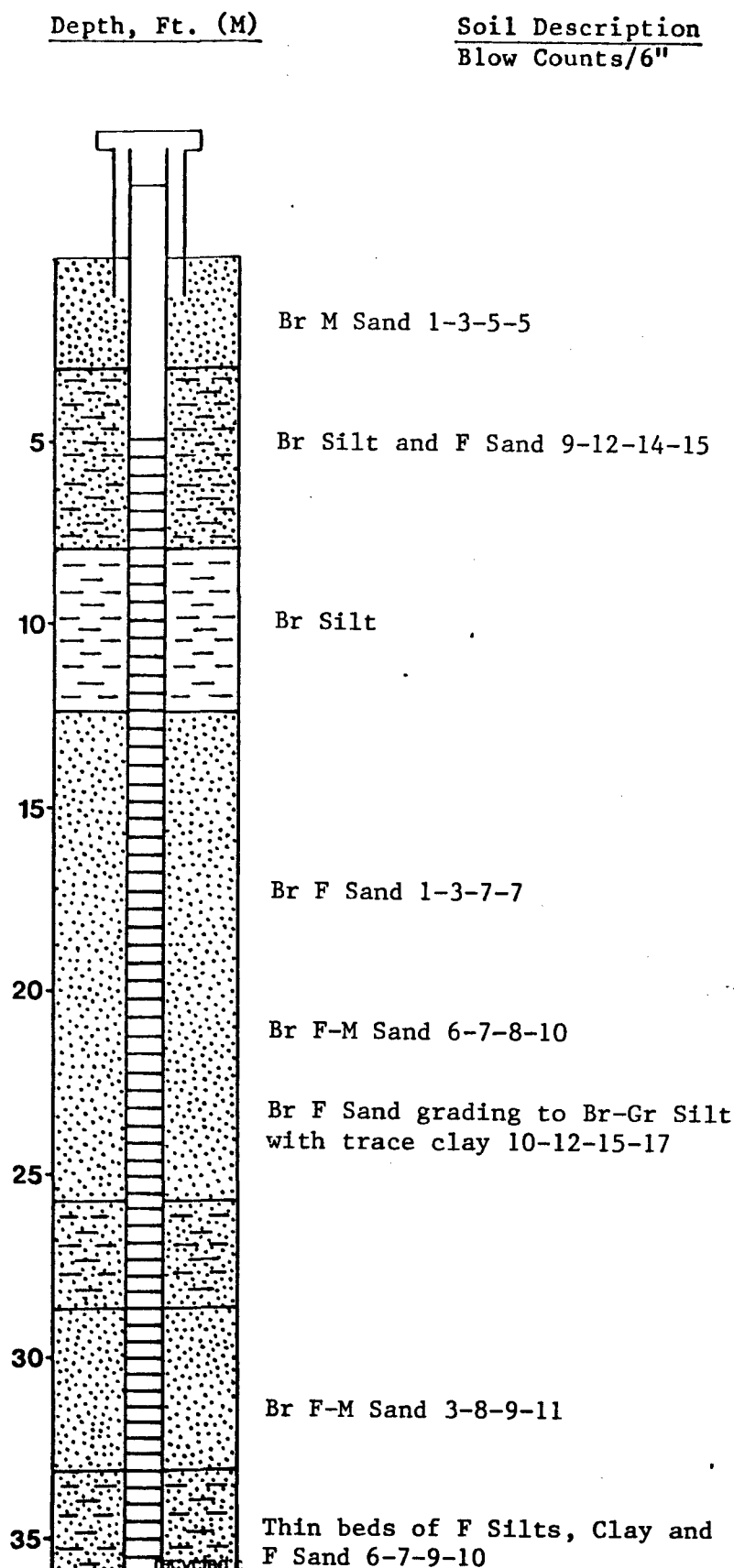
Gr-grey

R-red



ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 125/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley



Well No. W5
Location Woburn, MA

Owner U.S. EPA
Ground Elev 54' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 7/7/81
Type of Rig Truck Mounted

----- WELL DATA -----
Well Diam. 1.4" ID
Depth 65.5'
Screen Diam. 1.4" ID
Screen Setting 4'-65.5'
Screen Type Schedule 80 PVC
0.01" Slot

Well Type Monitoring
Static Water Level 2' 11"
Date Measured 10/30/81

----- WATER QUALITY -----
Samples Taken Yes ☒ No
No. of Samples
Type of Samples Priority
Pollutant

Date Sampled 11/30/81
Samplers Cook, Porter
Will be Analyzed for

Sampled for Volatile
Organics 11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 125/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W-5
Location

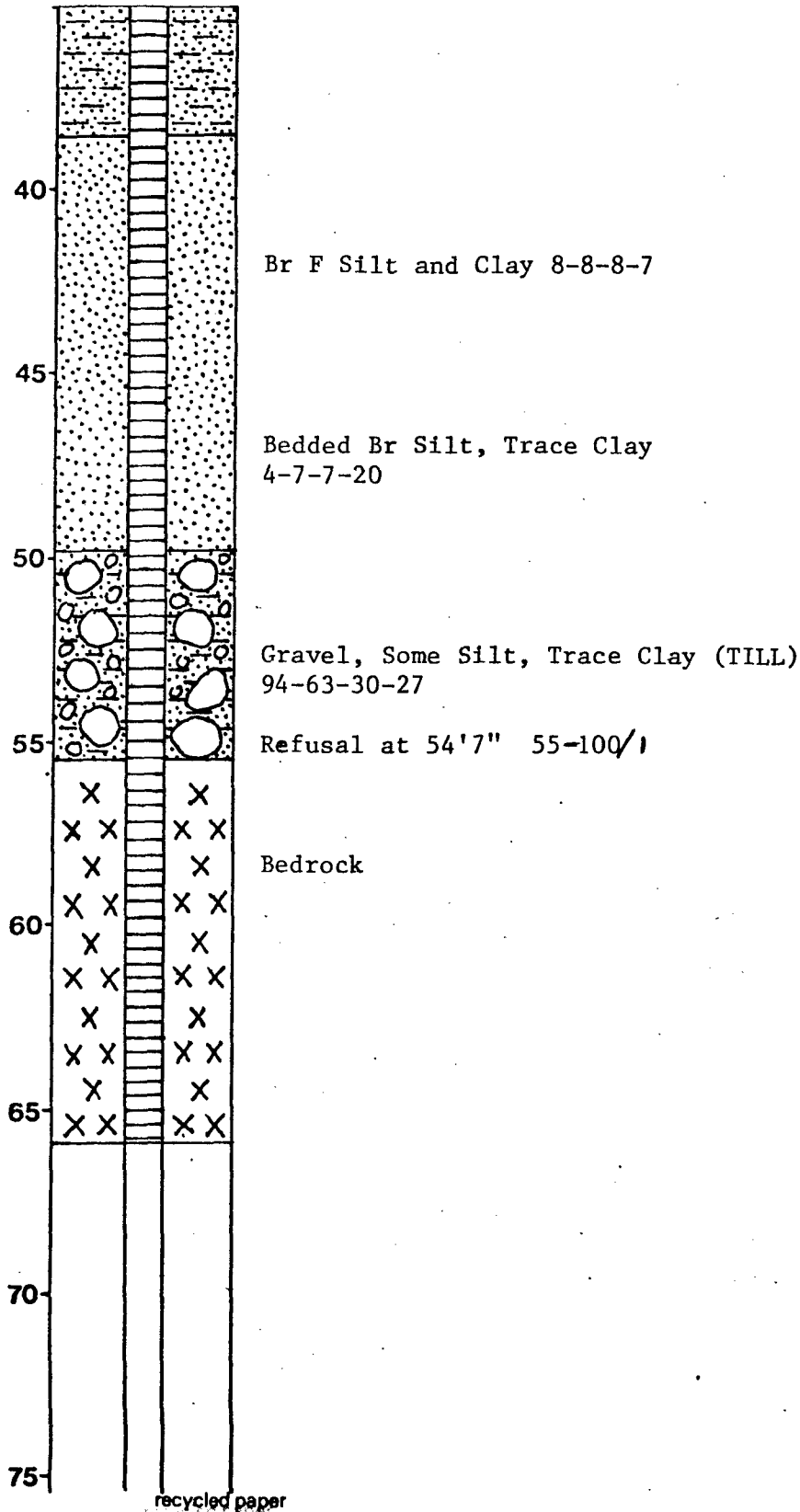
Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted
----- WELL DATA -----
Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured
----- WATER QUALITY -----
Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red



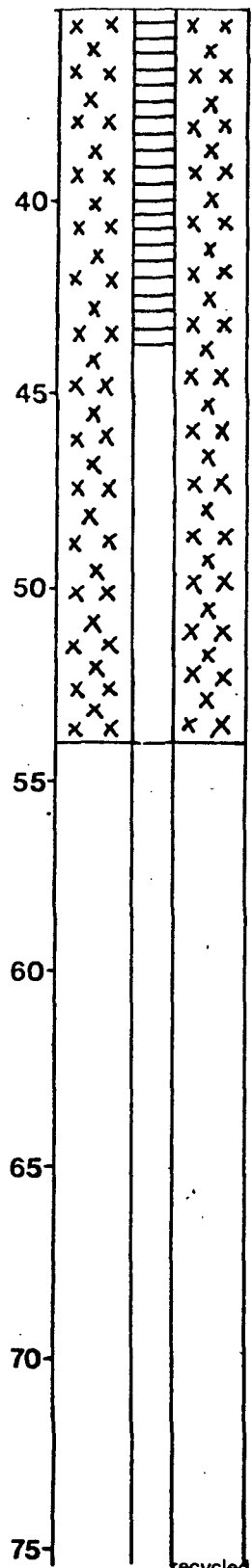
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 126/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. E41
Location



Bedrock

Owner U.S. EPA
Ground Elev.
Driller Geo-Metrics, Inc.
Drilling Completed
Type of Rig Truck Mounted
----- WELL DATA -----
Well Diam. 1.4" ID
Depth
Screen Diam. 1.4" ID
Screen Setting
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level
Date Measured
----- WATER QUALITY -----
Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 126/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. E41
Location Woburn, MA

Owner MDC
Ground Elev. 122.4' MSL
Driller Guild Drilling Co., Inc.
Drilling Completed 8/7/81
Type of Rig Truck Mounted

----- WELL DATA -----
Well Diam. 1.4" ID
Depth 54' 1"
Screen Diam. 1.4" ID
Screen Setting 34' 1"-44' 1"
Screen Type Schedule 80 PVC
0.01" Slot

Well Type Monitoring
Static Water Level 26' 2" MSL
Date Measured 10/30/81

----- WATER QUALITY -----
Samples Taken Yes ☒ No ☐

No. of Samples

Type of Samples Priority

Pollutants

Date Sampled 11/30/81

Samplers Cook, Porter

Will be Analyzed for

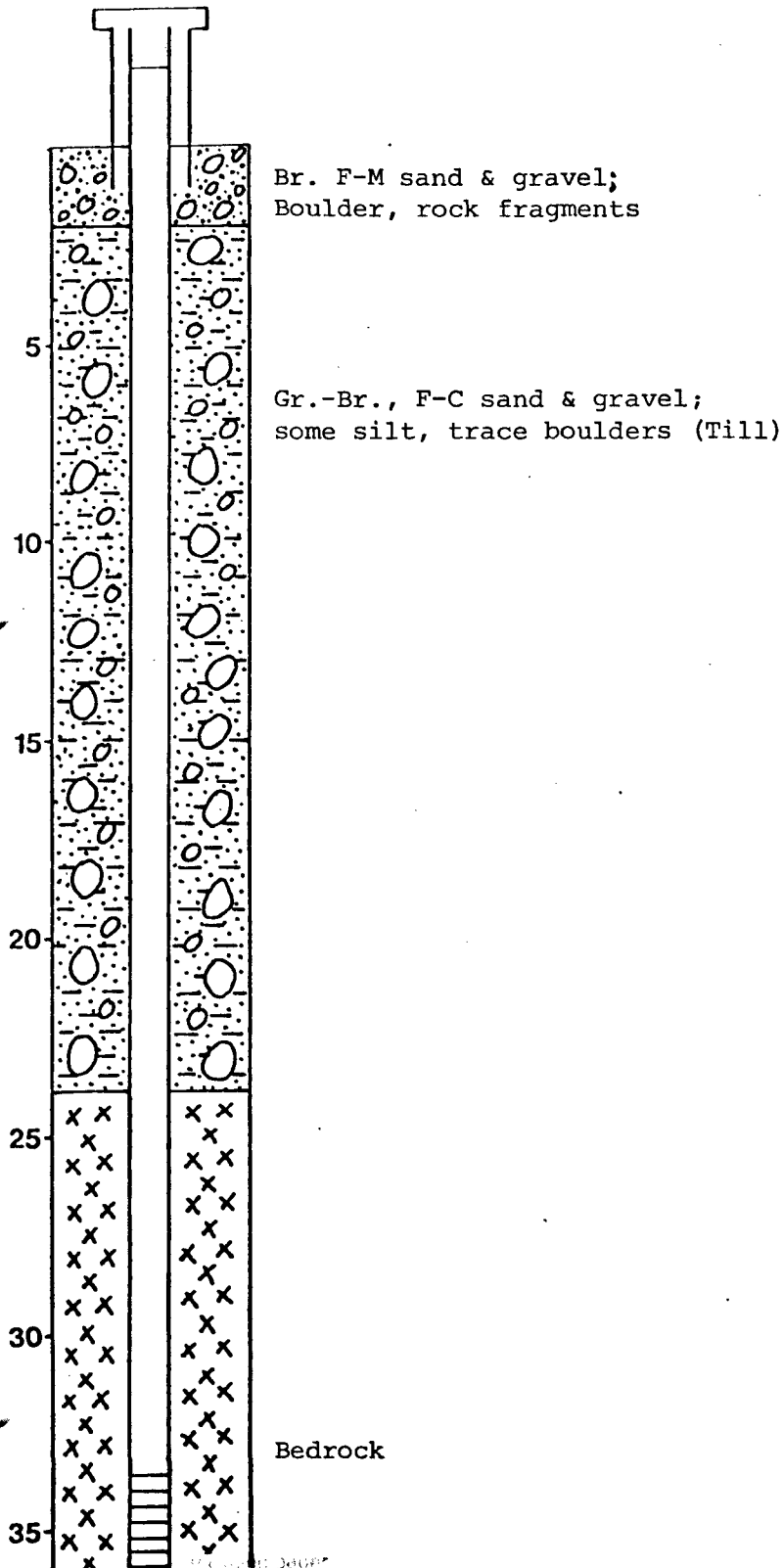
Sampled for Volatile Organics
11/3/81

REMARKS

Well Log Courtesy of Haley &
Aldrich, Inc. 238 Main Street
Cambridge, MA

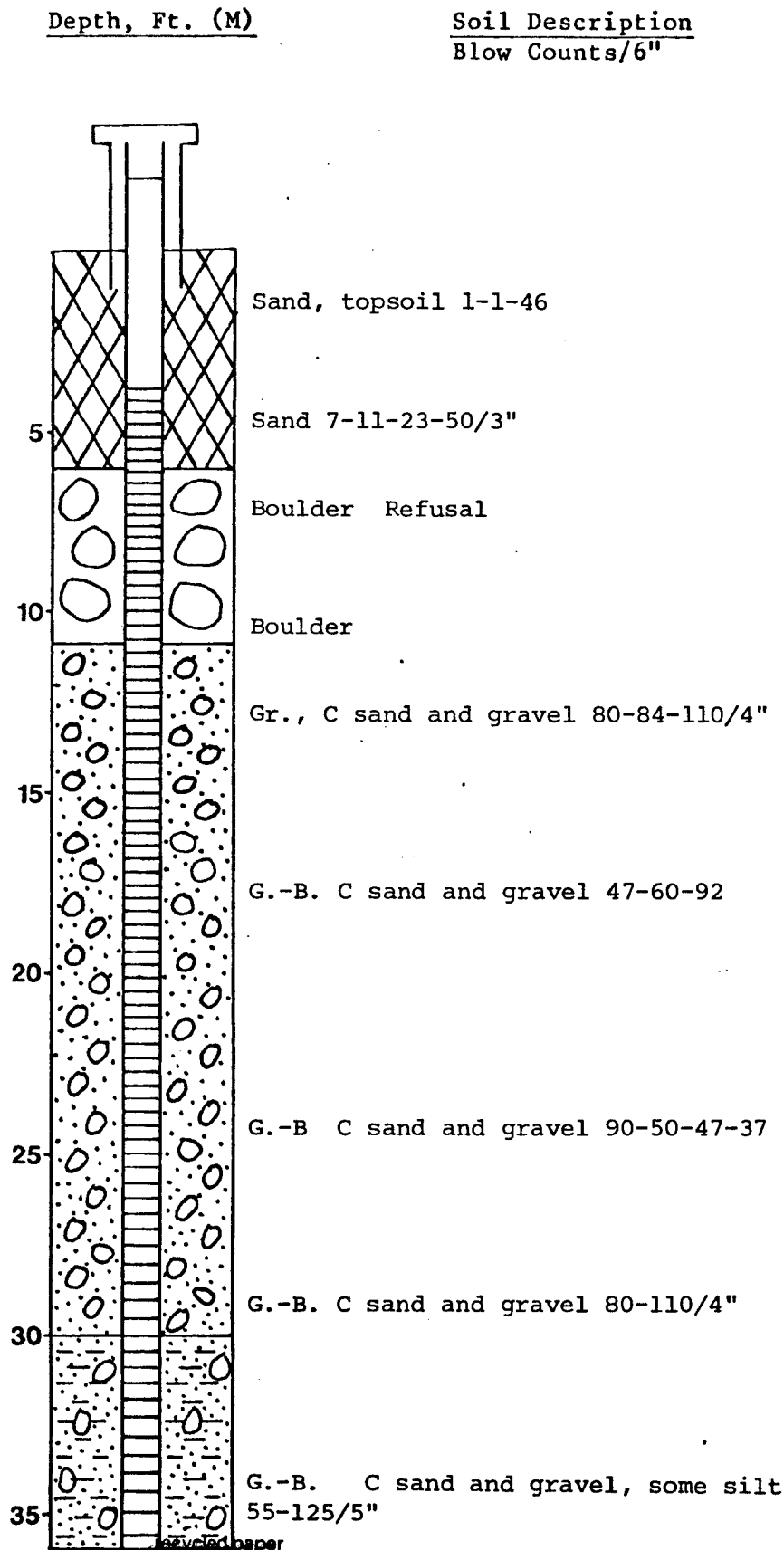
SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red



ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 127/1
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley



Well No. W22
Location Woburn, MA

Owner U.S. EPA
Ground Elev. 84' MSL
Driller Geo-Metrics, Inc.
Drilling Completed 9/22/81
Type of Rig Truck Mounted

----- WELL DATA -----
Well Diam. 1.4" ID
Depth 44' MSL
Screen Diam. 1.4" ID
Screen Setting 4'-44' MSL
Screen Type Schedule 80 PVC
0.01" Slot

Well Type Monitoring
Static Water Level 26'
Date Measured 10/15/81

----- WATER QUALITY -----
Samples Taken Yes ☒ No ☐
No. of Samples
Type of Samples Priority
Pollutants

Date Sampled
Samplers
Will be Analyzed for

Sampled for Volatile Organics
11/3/81

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

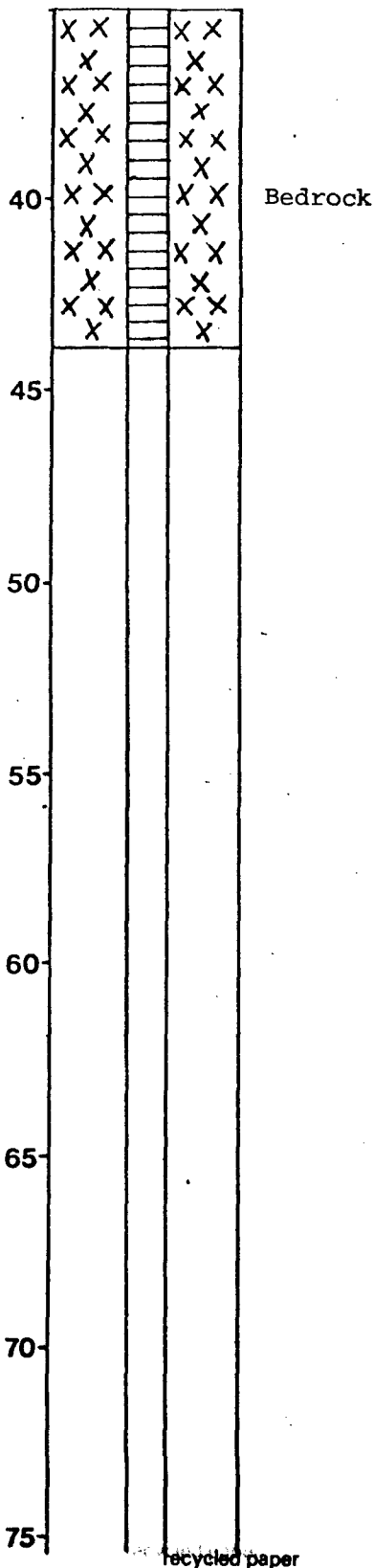
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 127/2
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared _____
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. W22
Location _____



Owner U.S. EPA
Ground Elev. _____
Driller Geo-Metrics, Inc.
Drilling Completed _____
Type of Rig Truck Mounted
----- WELL DATA -----
Well Diam. 1.4" ID
Depth _____
Screen Diam. 1.4" ID
Screen Setting _____
Screen Type Schedule 80 PVC
0.01" Slot
Well Type Monitoring
Static Water Level _____
Date Measured _____
----- WATER QUALITY -----
Samples Taken Yes _____ No _____
No. of Samples _____
Type of Samples _____

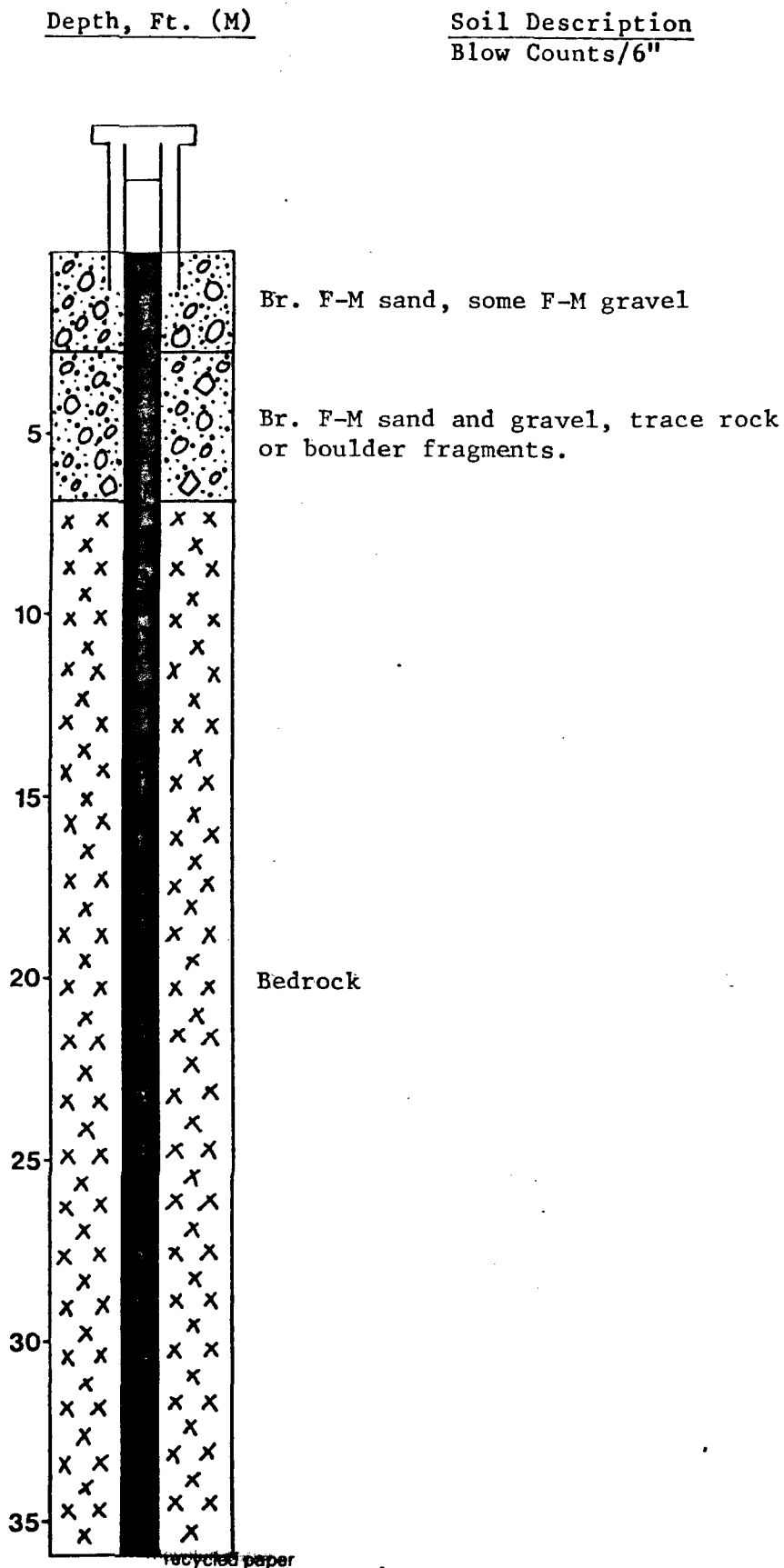
Date Sampled _____
Samplers _____
Will be Analyzed for _____

REMARKS

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 128
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley



Well No. E44 (Boring)
Location Woburn, MA
Owner MDC
Ground Elev. 106'2" MSL
Driller Guild Drilling Co., Inc.
Drilling Completed 8/11/81
Type of Rig Truck Mounted

WELL DATA
Well Diam.
Depth 36' 3"
Screen Diam.
Screen Setting
Screen Type

Well Type Boring
Static Water Level
Date Measured
WATER QUALITY
Samples Taken Yes No X
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS
Boring Log Courtesy of Haley
& Aldrich, Inc., Cambridge, MA.

SOIL DESCRIPTION ABBREVIATIONS
Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared 11/30/81
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. E 45 (Boring)

Location Woburn, MA

Owner MDC

Ground Elev. 122.8' MSL

Driller Guild Drilling Co. Inc.

Drilling Completed 8/14/81

Type of Rig Truck Mounted

----- WELL DATA -----

Well Diam.

Depth 54'

Screen Diam.

Screen Setting

Screen Type

Well Type Boring

Static Water Level

Date Measured

----- WATER QUALITY -----

Samples Taken Yes No X

No. of Samples

Type of Samples

Date Sampled

Samplers

Will be Analyzed for

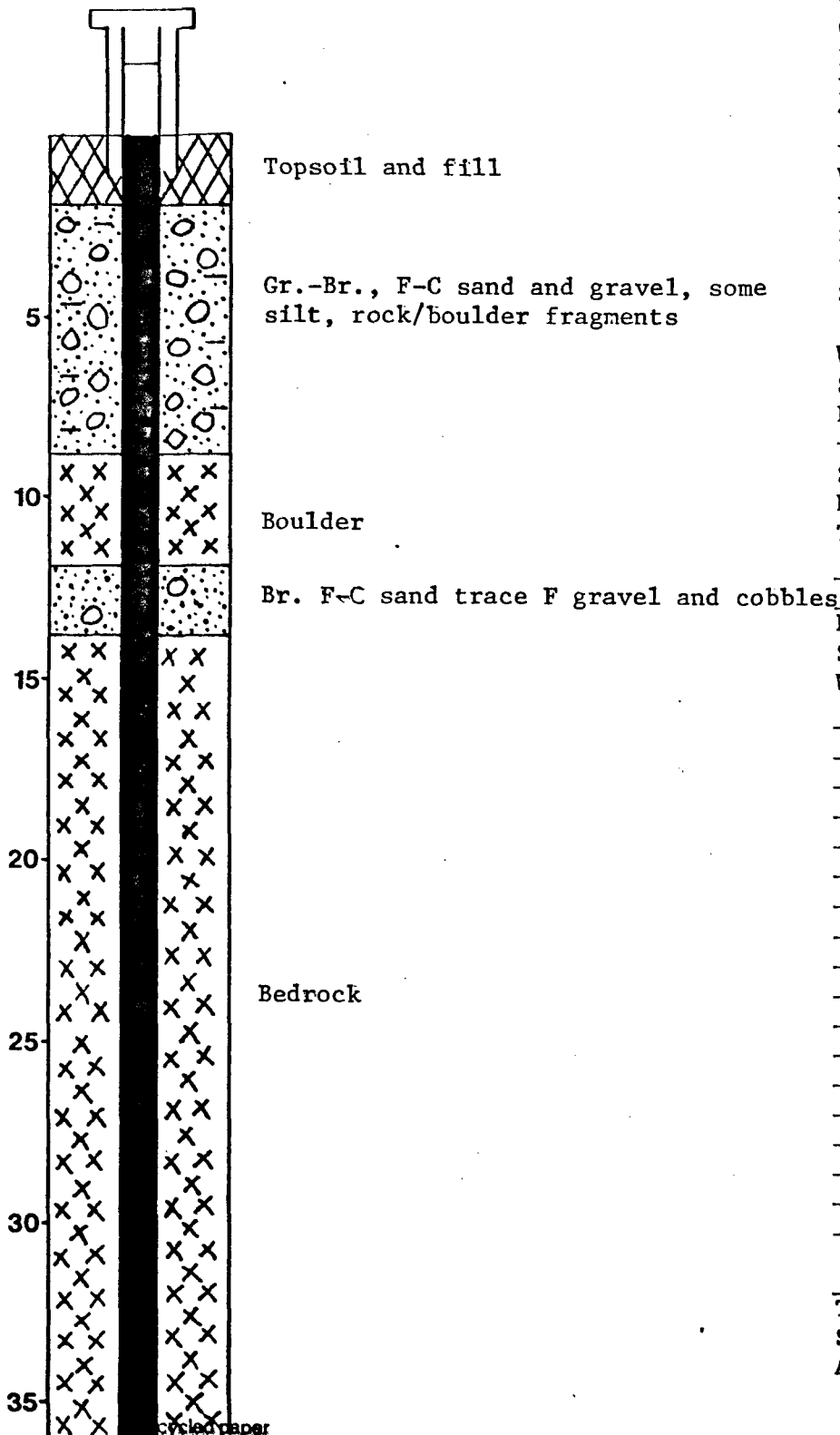
REMARKS

Boring Log Courtesy of Haley
& Aldrich, Inc. Cambridge, MA.

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10%	C-Coarse	Br-brown
Some 10-40%	M-Medium	Bl-black
And 40-50%	F-Fine	Y-yellow
		T-tan
		Gr-grey
		R-red

ecology and environment, inc.



APPENDIX B

Analytical Conditions for the Volatile Organic Analyses
Performed at the U.S. EPA Laboratory
in
Lexington, Massachusetts
on
November 4, 5, 1981

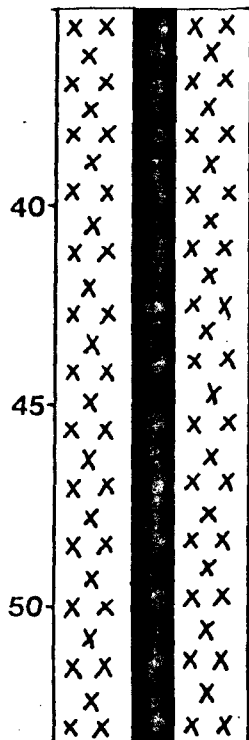
ECOLOGY AND ENVIRONMENT, INC.
30 East Cummings Park
Woburn, MA 01801

Well Log # 129
Project Name Woburn Well Survey
Project # TDD F1-8010-03A
Date Prepared
Prepared By M. Hanley

Depth, Ft. (M)

Soil Description
Blow Counts/6"

Well No. E45
Location



Bedrock

Owner
Ground Elev.
Driller
Drilling Completed
Type of Rig Truck Mounted
----- WELL DATA -----

Well Diam.
Depth
Screen Diam.
Screen Setting
Screen Type

Well Type
Static Water Level
Date Measured
----- WATER QUALITY -----
Samples Taken Yes No
No. of Samples
Type of Samples

Date Sampled
Samplers
Will be Analyzed for

REMARKS

SOIL DESCRIPTION ABBREVIATIONS

Trace 0-10% C-Coarse Br-brown
Some 10-40% M-Medium Bl-black
And 40-50% F-Fine Y-yellow
T-tan
Gr-grey
R-red

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

Date: Nov. 16, 1981

Subject: Woburn - 128 VOA

From: Elia Gorki & Maria Sataille

To: ET

Sent to John Hadley
Via Ray Thompson
11/17/81

Analytical Procedure: Fed Reg Vol 44 * 233 Dec. 3, 1979

Method of Quantitation:

Internal Std using response factors

Date Samples Received by Laboratory: Nov. 2, 1981

Date Samples Analyzed: Nov 4-5, 1981

Additional Comments:

- 7 -

**Analytical Conditions for
the Purgeables**

Instruments:

Tekmar LSC-1
HP-5985

Purge Conditions:

Gas:	Helium
Purge Time and Flow:	12 min, 40 ml/min
Trap:	Six in stainless steel (1/8 in OD) packed with 15 cm 60/80 mesh Tenax-GC plus 8 cm 35/80 mesh Davison type 15 Silica Gel
Desorption Time, Flow, Temperature:	4 min, 20 ml/min, 180°C
Bake out cycle:	7 min

Chromatographic Conditions:

Column:	Eight ft stainless steel (1/8 in OD) packed with 0.2% Carbowax 1500 coated on 60/80 mesh Carbowax C preceded by a 1 ft stainless steel column (1/8 in OD) packed with 3% Carbowax 1500 coated on 60/80 mesh Chromosorb W
Program:	Three min isothermal at ³⁰ 28°C then 10°/min to 170°C held for a total time of 45 min
Injector, Separator, Transfer Temperatures:	off, 275°C, 275°C
Carrier Gas and Flow:	Helium, 30 ml/min

Mass Spectrometer Conditions:

Electron Energy:	70 V
Mass Range:	⁴⁵ 35-260 AMU
Emission Current:	0.3 ma
Scan Rate:	12,8 msec/amu